(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 805 384 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
24.01.2018 Bulletin 2018/04

(21) Application number: **12821320.4**

(22) Date of filing: **19.12.2012**

(51) Int Cl.:
H01R 13/641 *(2006.01)* ***H01R 13/627*** *(2006.01)*
H01R 13/633 *(2006.01)* ***B60L 11/18*** *(2006.01)*

(86) International application number:
PCT/JP2012/008120

(87) International publication number:
WO 2013/108340 (25.07.2013 Gazette 2013/30)

(54) **ELECTRICAL CONNECTOR**

ELEKTRISCHER STECKVERBINDER

CONNECTEUR ÉLECTRIQUE

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(30) Priority: **17.01.2012 JP 2012007302**

(43) Date of publication of application:
26.11.2014 Bulletin 2014/48

(73) Proprietor: **Yazaki Corporation**
Tokyo 108-0073 (JP)

(72) Inventor: **OHMURA, Takenori**
Kakegawa-shi
Shizuoka 437-1421 (JP)

(74) Representative: **Hoffmann Eitle**
Patent- und Rechtsanwälte PartmbB
Arabellastraße 30
81925 München (DE)

(56) References cited:
EP-A2- 0 634 818
US-A- 5 558 533
US-A- 5 639 256

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

EP 2 805 384 B1

Printed by Jouve, 75001 PARIS (FR)

Description

Technical Field

[0001] The present invention relates to an electrical connector that is used to charge a battery mounted on a vehicle such as an electric vehicle or a hybrid electric vehicle.

Background Art

[0002] An electrical connector is used to charge a battery mounted on a vehicle such as an electric vehicle (EV) or a hybrid electric vehicle (HEV). Specifically, as illustrated in Fig. 1, an electrical connector 200 is fittable to a power receiving connector 300 provided with a power receiving terminal 301, and includes a power feeding terminal 211 that is connected to the power receiving terminal 301 when the electrical connector 200 is in a state of fitting to the power receiving connector 300.

[0003] The electrical connector 200 includes a connector fitting portion 210 that is provided with the power feeding terminal 211 therein and fits to the power receiving connector 300, and a connector case 220 that accommodates an electric wire W connected to the power feeding terminal 211.

[0004] In the connector case 220, the electric wire W connected to the power feeding terminal 211 inside the connector fitting portion 210 extends through a handle portion 221 to the outside, and a slide portion 230 absorbing an expansion/contraction according to a slide operation of the power feeding terminal 211, the electric wire W, or the like is provided between the connector fitting portion 210 and the handle portion 221.

[0005] When fitting the electrical connector 200 to the power receiving connector 300, a user holds the handle portion 221 and presses the electrical connector 200 against the power receiving connector 300 to fit the connector fitting portion 210 to the power receiving connector 300. Thereafter, when the user holds the handle portion 221 and pulls (turns) a turn lever 240, the power feeding terminal 211 slides by a slide portion 230 together with the electric wire W and thus the fitting to the power receiving terminal 301 of the power receiving connector 300 is completed. At this time, the handle portion 221 also moves in a fitting direction, and the slide portion 230 absorbs the sliding amount.

[0006] The electrical connector 200 is provided with a lever lock mechanism 250 that prevents the turn lever 240 from turning while the power feeding terminal 211 and the power receiving terminal 301 are being connected together. Accordingly, the power feeding terminal 211 can be prevented from sliding in a fitting release direction while the power feeding terminal 211 and the power receiving terminal 301 are being connected together, and thus the connection between the power feeding terminal 211 and the power receiving terminal 301 can be prevented from being abruptly disconnected during the charge of a battery.

[0007] US 5 639 256 A discloses a feeder connector comprising a feeding side connector on the power supply apparatus side and a receiving side connector on the car body side. The feeding side connector has a connector body, a protective case and a lock lever. The protective case consists of a main case made up of a cylinder portion, a half-cylinder portion and a trough portion, all formed integral, and a subcase. The connector body is formed integral with the cylinder portion of the main case through a flange formed along the periphery of the body. An opening is formed ranging from the cylinder portion of the main case to the subcase. In this opening, a lock lever for the receiving side connector is rotatably provided.

Citation List

Patent Literature

[0008] [PTL 1] Japanese Unexamined Patent Application Publication No. 10-275653

Summary of Invention

[0009] However, in the above-described related electrical connector 200, even when the connector fitting portion 210 is not in a state of completely fitting to the power receiving connector 300, the battery may be in a state of being chargeable because the slide portion 230 disposed between the connector fitting portion 210 and the handle portion 221 may contract and thus the power feeding terminal 211 may move to a fitting side together with the electric wire W.

[0010] That is, since the electrical connector 200 cannot detect whether the power receiving connector 300 and the connector fitting portion 210 completely fit to each other, the battery may be charged while the power receiving connector 300 and the connector fitting portion 210 are in a state of half-fitting together.

[0011] An object of the present invention is to provide an electrical connector that can detect a fitting state between a power receiving connector and a connector fitting portion and thus can improve safety more securely.

[0012] An electrical connector in accordance with some embodiments includes: a connector case including a connector fitting portion configured to fit to a power receiving connector and accommodating an electric wire; a power feeding terminal provided in the connector fitting portion and connected to the electric wire, the power feeding terminal being configured to be connected to a power receiving terminal of the power receiving connector in a fitting state where the power receiving connector and the connector fitting portion are fitted together; a lock mechanism configured to prevent the power receiving connector and the connector fitting portion from being separated from each other in the fitting state between the power receiving connector and the connector fitting

portion; a fitting detecting mechanism configured to detect the fitting state between the power receiving connector and the connector fitting portion; and a lock release unit including an operating portion advanceable from and retractable to the connector case, and a latch portion configured to latch to a portion of the lock mechanism and a portion of the fitting detecting mechanism with the operating portion being retracted to the connector case. Upon release of the latching of the latch portion in the fitting state between the power receiving connector and the connector fitting portion, the operating portion of the lock release unit is configured to move in a direction where the operating portion advances from the connector case and become operatable to enable release of the fitting state between the power receiving connector and the connector fitting portion. The lock mechanism includes a first lock unit including a lock arm swingably provided in the connector case, and a lock claw provided at one end of the lock arm at a side of the power receiving connector and being protrudable and retractable from the connector fitting portion, and a second lock unit including an auxiliary arm connected to the lock arm, and an auxiliary latch piece provided at an end of the auxiliary arm and configured to latch to the latch portion of the lock release unit. The latching of the auxiliary latch piece to the latch portion of the lock release unit is released with the lock claw being retracted in the connector fitting portion by swing of the lock arm and the auxiliary arm. The fitting detecting mechanism includes a latch arm swingably provided in the connector case, a latch claw provided at one end of the latch arm at a side of the power receiving connector and being protrudable and retractable from the connector fitting portion, and a latch piece provided at the other end of the latch arm and being latchable to the latch portion of the lock release unit. The latch claw is provided at a nearer side than the lock claw in a fitting direction where the connector fitting portion is fitted to the power receiving connector. The latching of the latch piece to the latch portion of the lock release unit is released with the latch claw being retracted in the connector fitting portion by swing of the latch arm.

[0013] According to the above configuration, the lock mechanism includes the first lock unit and the second lock unit. The latching of the auxiliary latch piece to the latch portion of the lock release unit is released with the lock claw being retracted in the connector fitting portion by swing of the lock arm and the auxiliary arm. The latch claw is provided on the nearer side than the lock claw in the fitting direction of the connector fitting portion to the power receiving connector. The latching of the latch piece to the latch portion of the lock release unit is released with the latch claw being retracted in the connector fitting portion by swing of the latch arm. Accordingly, the latch claw is retracted into the connector fitting portion by the abutting on the power receiving connector to be later than the lock claw. Therefore, the latching between the latch piece and the latch portion of the lock release unit by the swing of the latch arm is not released unless the latching between the auxiliary latch piece and the latch portion of the lock release unit by the swing of the lock arm is released.

[0014] That is, when only the latching between the auxiliary latch piece and the latch portion of the lock release unit is released, the power receiving connector and the connector fitting portion are not in a state of completely fitting together and thus the operating portion of the lock release unit does not protrude from the connector case and is yet unoperatable. On the other hand, when the latching between the auxiliary latch piece and the latch portion of the lock release unit is released and also the latching between the latch piece and the latch portion of the lock release unit is released, the power receiving connector and the connector fitting portion are in a state of completely fitting together and thus the operating portion of the lock release unit protrudes from the connector case and becomes operatable. Accordingly, the fitting state between the power receiving connector and the connector fitting portion can be detected according to the positional state of the operating portion of the lock release unit. Therefore, the battery can be prevented from being charged in the half-fitting state, thus making it possible to improve stability more securely.

[0015] The latch claw may be provided with the lock claw along the fitting direction.

[0016] According to the above configuration, the latch claw is provided with the lock claw along the fitting direction. Accordingly, for example, when the power receiving connector is damaged, even when the lock claw does not abut the power receiving connector and only the latch claw abuts the power receiving connector and is retracted into the connector fitting portion, the latching between the lock piece and the latch portion of the lock release unit is not released. Therefore, when the power receiving connector and the connector fitting portion are not in a state of completely fitting together (that is, when the lock claw is not locked to the power receiving connector), the operating portion of the lock release unit does not protrude from the connector case and can be made unoperatable.

[0017] The first lock unit may include a lock piece provided at the other end of the lock arm and being latchable to the latch portion of the lock release unit. The lock piece may be provided at a position facing the auxiliary latch piece.

[0018] According to the above configuration, the lock piece is provided at a position facing the auxiliary latch piece. Accordingly, the lock piece and the auxiliary latch piece can be latched to the latch portion of the lock release unit, thus making it possible to provide double locking. Therefore, even when the latching between the auxiliary latch piece and the latch portion of the lock release unit is released, the operating portion of the lock release unit does not protrude from the connector case and is unoperatable until the latching between the lock piece and the latch portion of the lock release unit is released. Accordingly, the abrupt protrusion of the operating por-

tion of the lock release unit from the connector case can be securely prevented.

[0019] The first lock unit may include a lock arm shaft configured to pivotally support the lock arm to be swingable, and a lock arm bias member configured to bias the lock arm in a direction where the lock claw protrudes from the connector fitting portion. The fitting detecting mechanism may include a latch arm shaft configured to pivotally support the latch arm to be swingable, and a latch arm bias member configured to bias the latch arm in a direction where the latch claw protrudes from the connector fitting portion. The lock release unit may include a release bias member configured to bias the lock release unit in the direction where the operating portion advances from the connector case.

[0020] According to the above-described configuration, it is possible to provide an electrical connector that can detect a fitting state between a power receiving connector and a connector fitting portion and thus can improve safety more securely.

Brief Description of Drawings

[0021]

[fig.1]Fig. 1 is a cross-sectional view illustrating a related electrical connector.

[fig.2]Fig. 2 is a perspective view illustrating an electrical connector according to a present embodiment.

[fig.3]Fig. 3 is a partially exploded perspective view illustrating the electrical connector according to the present embodiment.

[fig.4]Fig. 4 is a cross-sectional view illustrating the electrical connector according to the present embodiment.

[fig.5]Fig. 5 is a perspective view illustrating the inside of the electrical connector according to the present embodiment.

[fig.6]Fig. 6 is an enlarged perspective view illustrating the neighborhood of a second lock unit (a lock arm is omitted herein) and a plan/side view of a lock claw and a latch claw according to the present embodiment.

[fig.7]Fig. 7 is an enlarged perspective view illustrating a portion of a first lock unit and a portion of the second lock unit according to the present embodiment.

[fig.8]Fig. 8 is an enlarged perspective view illustrating the neighborhood of a lock release unit according to the present embodiment.

[fig.9]Fig. 9 is an enlarged perspective view illustrating the neighborhood of the first lock unit and a power feedability determining mechanism (the second lock unit is omitted herein) according to the present embodiment (No. 1).

[fig.10]Fig. 10 is an enlarged perspective view illustrating the neighborhood of the first lock unit and the power feedability determining mechanism (the second lock unit is omitted herein) according to the present embodiment (No. 2).

[fig.11]Fig. 11 is an enlarged perspective view illustrating the neighborhood of the lock release unit and the power feedability determining mechanism according to the present embodiment.

[fig.12]Fig. 12 is an enlarged perspective view illustrating the neighborhood of the power feedability determining mechanism according to the present embodiment (No. 1).

[fig.13]Fig. 13 is an enlarged perspective view illustrating the neighborhood of the power feedability determining mechanism according to the present embodiment (No. 2).

[fig.14]Fig. 14 is an enlarged perspective view illustrating the neighborhood of a release switch hold portion according to the present embodiment.

[fig.15]Fig. 15 is a plan view (top view) illustrating the inside of the electrical connector according to the present embodiment.

[fig.16]Fig. 16 is a cross-sectional view illustrating an operation (separated state) of the electrical connector according to the present embodiment.

[fig.17]Fig. 17 is a cross-sectional view illustrating an operation (fitting state) of the electrical connector according to the present embodiment (No. 1).

[fig.18]Fig. 18 is a cross-sectional view illustrating an operation (fitting state) of the electrical connector according to the present embodiment (No. 2).

[fig.19]Fig. 19 is an enlarged perspective view illustrating the neighborhood of a lock mechanism and the lock release unit according to the present embodiment (No. 1).

[fig.20]Fig. 20 is a cross-sectional view illustrating an operation (fitted state) of the electrical connector according to the present embodiment.

[fig.21]Fig. 21 is an enlarged perspective view illustrating the neighborhood of the lock mechanism and the lock release unit according to the present embodiment (No. 2).

[fig.22]Fig. 22 is an enlarged perspective view illustrating an operation of a movable shaft of the power feedability determining mechanism according to the present embodiment (No. 1).

[fig.23]Fig. 23 is an enlarged perspective view illustrating an operation of the movable shaft of the power feedability determining mechanism according to the present embodiment (No. 2).

[fig.24]Fig. 24 is a cross-sectional view illustrating an operation (separating state) of the electrical connector according to the present embodiment (No. 1).

[fig.25]Fig. 25 is a cross-sectional view illustrating an operation (separating state) of the electrical connector according to the present embodiment (No. 2).

[fig.26]Fig. 26 is a cross-sectional view (partially enlarged cross-sectional view of Fig. 25) illustrating an operation of the electrical connector according to the present embodiment.

Description of Embodiments

[0022] Hereinafter, an electrical connector according to embodiments of the present invention will be described with reference to the drawings. Specifically, (1) Configuration of Electrical Connector, (2) Operation of Electrical Connector, (3) Function and Effect, and (4) Other Embodiments will be described.

[0023] Also, in the following description of the drawings, identical or similar reference numerals are given to identical or similar portions. However, it should be noted that the drawings are schematic and dimensional ratios and the like are different from actual ones.

[0024] Accordingly, specific sizes and the like should be determined in consideration of the following description. In addition, there may be some differences in dimensional relations and ratios between the mutual drawings.

(1) Configuration of Electrical Connector

[0025] First, a configuration of an electrical connector 100 according to the present embodiment will be described with reference to Figs. 2 to 15. Figs. 2 to 15 are views for describing a configuration of the electrical connector 100 according to the present embodiment.

[0026] As illustrated in Figs. 2 to 4, the electrical connector 100 is fittable to a power receiving connector 10 provided with a power receiving terminal 11A (see Fig. 4) used for power feeding, and includes a power feeding terminal 111A that is connected to the power receiving terminal 11A when the electrical connector 100 is in a state of fitting to the power receiving connector 10. As illustrated in Fig. 4, the power receiving connector 10 includes a connector housing 11 that accommodates the power receiving terminal 11A and a signal terminal 11B for a control circuit such as signaling/ displaying, and a hood portion 12 that is integrated with the connector housing 11 and has an inner periphery that fits to a front end of the electrical connector 100 (an outer periphery of a connector fitting portion 111).

[0027] As illustrated in Figs. 3 and 4, the electrical connector 100 includes a connector case 110, a lock mechanism 120, a fitting detecting mechanism 130, a lock release unit 140, a power feedability determining mechanism 150, and a release switch hold portion 160.

(Connector Case)

[0028] The connector case 110 has a cylindrical shape. As illustrated in Fig. 5, the connector case 110 includes the connector fitting portion 111 that is provided with the power feeding terminal 111A therein and fits to the connector housing 11 of the power receiving connector 10, and accommodates an electric wire W connected to the power feeding terminal 111A.

[0029] A terminal receiving chamber 112 accommodating the power feeding terminal 111A is provided at the right and left sides of the connector fitting portion 111, and a composite terminal receiving chamber 113 accommodating a signal terminal 111B for a control circuit such as signaling/displaying is provided at top and bottom of the connector fitting portion 111 (see Fig. 2). The electric wire W is connected to the power feeding terminal 111A and the signal terminal 111B by pressure bonding or the like.

[0030] As illustrated in Figs. 3 to 5, a lock chamber 114 accommodating the lock mechanism 120, the fitting detecting mechanism 130, and the lock release unit 140 is provided over the electric wire W in the connector case 110. A handle portion 115 held by an operator is provided at a rear bottom of the connector case 110, and the electric wire W extends through the handle portion 115 to the outside.

(Lock Mechanism)

[0031] The lock mechanism 120 prevents the separation between the power receiving connector 10 and the electrical connector 100 when the power receiving connector 10 and the connector fitting portion 111 are in a state of fitting together (i.e. in a fitting state where the power receiving connector 10 and the connector fitting portion 111 are fitted together). As illustrated in Fig. 5, the lock mechanism 120 includes a first lock unit 120A and a second lock unit 120B.

[0032] As illustrated in Figs. 5 and 8 to 10, the first lock unit 120A includes a biforked lock arm 121 that is swingably provided in the connector case 110, a lock claw 122 (Figs. 2, 4 and 5) that is provided at one end of the lock arm 121 on a power receiving connector 10 side and is protrudable/retractable from an outer periphery of the connector fitting portion 111, and a lock piece 123 that is provided at the other end of the lock arm 121 and is latchable to a latch groove portion 143 of the lock release unit 140.

[0033] The lock arm 121 is pivotally supported to be swingable by a lock arm shaft 124, and the lock claw 122 is biased by a coil spring 125 as a lock arm bias member toward a top direction TD that is a protruding direction from the outer periphery of the connector fitting portion 111.

[0034] The lock arm 121 is bent at the side of the lock claw 122 from the lock arm shaft 124 in a width direction WD perpendicular to a fitting/separating direction FSD (see Figs. 8 to 10). The lock arm 121 is bent in a bottom direction BD at the position of the lock arm shaft 124, and the lock piece 123 extends from the bent front end in the fitting/ separating direction FSD (see Figs. 5 and 8 to 10).

[0035] The fitting/separating direction FSD includes a direction of fitting the electrical connector 100 to the power receiving connector 10 (hereinafter referred to as a fitting direction FD) and a direction of separating the electrical connector 100 from the power receiving connector 10 (hereinafter referred to as a separating direction SD).

[0036] The lock arm 121 is provided with a pressing

portion 121A (see Fig. 14) that presses a micro switch MS that can detect the protrusion/retraction of the lock claw 122 from a cutout 116 (see Figs. 2, 4 and 5) formed at the connector fitting portion 111. As illustrated in Fig. 7(a), when the lock claw 122 protrudes from the cutout 116 of the connector fitting portion 111, the pressing portion 121A does not press the micro switch MS. As illustrated in Fig. 7(b), when the lock claw 122 retracts into the connector fitting portion 111, the pressing portion 121A presses the micro switch MS.

[0037] A support groove 121B (see Figs. 8 to 10) supporting the second lock unit 120B is formed at the lock arm 121, and the second lock unit 120B abuts an edge portion of the support groove 121B and thus swings together with the lock arm 121.

[0038] The lock claw 122 is protrudable from/retractable to (advanceable from/retractable to) the cutout 116 of the connector fitting portion 111 to the outside. A power receiving connector 10 side of the lock claw 122 is provided with a cam surface 122A inclining in the fitting/separating direction FSD, and a separating direction SD side of the lock claw 122 is provided with a lock surface 122B perpendicular to the fitting/separating direction FSD (see Fig. 6(b)).

[0039] The lock piece 123 extends in the top direction TD, and is latchable to the latch groove portion 143 (first latch groove portion 143A) of the lock release unit 140. The lock piece 123 is provided at a position facing a latch piece 133 of the fitting detecting mechanism 130, which will be described later. An air gap 123A (see Figs. 8 to 10) opening in the width direction WD perpendicular to the fitting/separating direction FSD is provided between the lock piece 123 and the lock arm 121.

[0040] While the lock claw 122 is in a state of retracting into the connector fitting portion 111, the lock arm 121 swings, so that the lock piece 123 latches to the latch groove portion 143 (first latch groove portion 143A) of the lock release unit 140. While the lock claw 122 is in a state of protruding from the connector fitting portion 111, the lock arm 121 swings, so that the latching of the lock piece 123 to the latch groove portion 143 of the lock release unit 140 is released.

[0041] As illustrated in Figs. 5 and 6, the second lock unit 120B includes an auxiliary arm 126 that is connected to the lock arm 121, and an auxiliary latch piece 127 that is provided at an end of the auxiliary arm 126 on the near side in the fitting direction FD and is latchable to the latch groove portion 143 (second latch groove portion 143B) of the lock release unit 140.

[0042] The auxiliary arm 126 is pivotally supported to be swingable by the lock arm shaft 124, and the auxiliary latch piece 127 is biased by a coil spring 129 in the bottom direction BD. The auxiliary arm 126 is provided in the support groove 121 B formed at the lock arm 121, and swings together with the lock arm 121.

[0043] The auxiliary latch piece 127 extends in the bottom direction BD, and is latchable to the latch groove portion 143 (second latch groove portion 143B) of the lock release unit 140. The auxiliary latch piece 127 is provided at a position facing the lock piece 123. While the lock claw 122 is in a state of retracting into the connector fitting portion 111, the lock arm 121 swings, so that the latching of the auxiliary latch piece 127 to the latch groove portion 143 (second latch groove portion 143B) of the lock release unit 140 is released.

[0044] A power receiving connector 10 side of the auxiliary latch piece 127 is provided with a lock surface 127B perpendicular to the fitting/separating direction FSD, and a separating direction SD side of the auxiliary latch piece 127 is provided with a cam surface 127A inclining in the fitting/separating direction FSD (see Figs. 6(a) and 8).

(Fitting Detecting Mechanism)

[0045] The fitting detecting mechanism 130 detects a fitting state between the power receiving connector 10 and the connector fitting portion 111. As illustrated in Figs. 5 and 8 to 10, the fitting detecting mechanism 130 includes a latch arm 131 that is swingably provided in the connector case 110, a latch claw 132 (Figs. 2, 4 and 5) that is provided at one end of the latch arm 131 on a power receiving connector 10 side and is protrudable/retractable from the connector fitting portion 111, and a latch piece 133 that is provided at the other end of the latch arm 131 and is latchable to the latch groove portion 143 (second latch groove portion 143B) of the lock release unit 140.

[0046] The latch arm 131 is pivotably supported by a latch arm shaft 134, and the latch claw 132 is biased by a coil spring 135 as a latch arm bias member toward the top direction TD that is the protruding direction from the outer periphery of the connector fitting portion 111.

[0047] The latch arm 131 includes a protrusion 131A (see Fig. 6) as a latch state release portion that releases the latching between the latch groove portion 143 and the release switch hold portion 160 (a hold latch piece 162 to be described later) when the later-described latch groove portion 143 (second latch groove portion 143B) of the lock release unit 140 and the latch piece 133 latch together. The protrusion 131A protrudes in the bottom direction BD to abut the release switch hold portion 160 (a hold arm 161 to be described later).

[0048] The latch claw 132 is protrudable/retractable (advanceable/retractable) to the outside from the cutout 116 formed at the connector fitting portion 111. A power receiving connector 10 side of the latch claw 132 is provided with a cam surface 132A inclining in the fitting/separating direction FSD, and a separating direction SD side of the latch claw 132 is provided with a perpendicular surface 132B perpendicular to the fitting/separating direction FSD (see Fig. 6(c)). The latch claw 132 is provided on the nearer side than the lock claw 122 in the fitting direction FD (that is, on the separating direction SD side of the lock claw 122), and is provided with the lock claw 122 along the fitting/separating direction FSD (or along the fitting direction FD).

[0049] A width W2 of the latch claw 132 in the width direction WD is smaller than a width W1 of the lock claw 122 in the width direction WD (see Figs. 6(b) and 6(c)). That is, the latch claw 132 is provided within a projection surface of the lock claw 122 when viewed from a front side of the electrical connector 100.

[0050] The latch piece 133 is provided on the nearer side than the lock claw 122 in the fitting direction of the connector fitting portion 111 to the power receiving connector 10. While the latch claw 132 is in a state of retracting into the connector fitting portion 111, the latch arm 131 swings, so that the latching of the latch piece 133 to the latch groove portion 143 (second latch groove portion 143B) of the lock release unit 140 is released.

(Lock release unit)

[0051] The lock release unit 140 is slidable in the fitting/separating direction FSD, and is biased by a coil spring 144 to a rear side of the fitting direction FD (that is, a separating direction SD side). As illustrated in Fig. 5, the lock release unit 140 includes a release switch 141 as an operation portion advanceable from/retractable to the connector case 110, and a release body portion 142 integrated with the release switch 141. The lock release unit 140 releases the latch state between the power receiving connector 10 and the connector fitting portion 111 by the pressing operation of the release switch 141.

[0052] The release body portion 142 is provided with the latch groove portion 143 as a latch portion that is latched to a portion (lock piece 123 and auxiliary latch piece 127) of the lock mechanism 120 in the connector case 110 and to a portion (latch piece 133) of the fitting detecting mechanism 130. The latch groove portion 143 includes the first latch groove portion 143A latching to the lock piece 123, and the second latch groove portion 143B latching to the auxiliary latch piece 127. The first latch groove portion 143A is provided at a bottom side of the release body portion 142, and the second latch groove portion 143B is provided at a top side of the release body portion 142 to face the first latch groove portion 143A.

[0053] A spring support portion 142A biased by the coil spring 144 as a release bias member is provided on the upper side of the release body portion 142. By the biasing of the coil spring 144 to the release body portion 142, the release switch 141 is movable in the direction of protruding from the connector case 110 (that is, the separating direction SD). That is, while the power receiving connector 10 and the connector fitting portion 111 are in a state of fitting together, when all the latching to the latch groove portion 143 is released, the release switch 141 moves in the separating direction SD and becomes operatable, so that the lock release unit 140 can be used to release the fitting state between the power receiving connector 10 and the connector fitting portion 111.

[0054] A regulation wall surface 145 (Figs. 11 to 13) is provided under the release body portion 142, and is movable in the fitting/separating direction FSD between a micro switch 151 and a movable shaft 153 of the power feedability determining mechanism 150.

[0055] The regulation wall surface 145 moves in the fitting/separating direction FSD together with the release switch 141 and the release body portion 142. Specifically, when all the latch pieces (lock piece 123, auxiliary latch piece 127, and latch piece 133) latch to the latch groove portion 143, the release switch 141 is in a state of being pressed and the regulation wall surface 145 is located between the micro switch 151 and the movable shaft 153 as illustrated in Fig. 12. On the other hand, when all the latching to the latch groove portion 143 is released, the release switch 141 protrudes from the connector case 110, so that the regulation wall surface 145 retracts from a portion between the micro switch 151 and the movable shaft 153 as illustrated in Fig. 13.

(Power Feedability Determining Mechanism)

[0056] The power feedability determining mechanism 150 determines the power feedability between the power receiving connector 10 and the connector fitting portion 111 by enabling power feeding when the power receiving connector 10 and the connector fitting portion 111 are in a state of fitting together (in a complete fitting state), and by disabling power feeding when the power receiving connector 10 and the connector fitting portion 111 are in a state of half-fitting together (in an incomplete fitting state).

[0057] As illustrated in Figs. 8 to 10, 11, and 12, the power feedability determining mechanism 150 includes the micro switch 151 and a solenoid 152 that is provided at a position spaced apart from the micro switch 151 in the width direction WD.

[0058] The micro switch 151 does not flow a current from the electrical connector 100 to the power receiving connector 10 when the micro switch 151 is not in a state of being abutted by a portion (movable shaft 153 to be described below) of the solenoid 152.

[0059] The solenoid 152 includes a movable shaft 153 that moves in the width direction WD when the power receiving connector 10 and the connector fitting portion 111 change from a half-fitting state to a fitting state, and a regulation arm 154 (see Figs. 9 and 10) that moves according to the movement of the movable shaft 153.

[0060] The movable shaft 153 moves according to information (instruction) from a power supply unit (not illustrated) connected to an end portion of the electric wire W extending from the handle portion 115 to the outside. When the above-described regulation wall surface 145 of the lock release unit 140 is located between the micro switch 151 and the movable shaft 153, the movable shaft 153 does not abut the micro switch 151 (see Fig. 12).

[0061] The regulation arm 154 is insertable/extractable into/from the air gap 123A formed at the lock arm 121. The regulation arm 154 is inserted into the air gap 123A to regulate the swing of the lock arm 121. As illustrated

in Figs. 8 to 10, the regulation arm 154 includes a connection portion 154A connected to the movable shaft 153, an arm portion 154B provided in the fitting/separating direction FSD, and a front end portion 154C insertable into the air gap 123A. For example, as illustrated in Fig. 9, the front end portion 154C is located outside the air gap 123A when the movable shaft 153 is in a state of being spaced apart from the micro switch 151. On the other hand, as illustrated in Fig. 10, when the front end portion 154C moves in the width direction WD together with the movable shaft 153 and the movable shaft 153 is in a state of abutting the micro switch 151, the front end portion 154C is located inside the air gap 123A.

(Release Switch Hold Portion)

[0062] The release switch hold portion 160 holds the release switch 141 of the lock release unit 140 when the release switch 141 is in a state of being pressed. As illustrated in Figs. 14 and 15, the release switch hold portion 160 includes a hold arm 161 that is swingably provided in the connector case 110, and a hold latch piece 162 that is provided at a near side end portion of the hold arm 161 in the fitting direction FD and is latched to the second latch groove portion 143B of the lock release unit 140 at a position where the release switch 141 is pressed.

[0063] The hold arm 161 is pivotably supported by a hold arm shaft 163, and a rear side in the fitting direction FD (that is, the separating direction SD side) is biased by a coil spring 164 as a hold arm bias member toward the bottom direction BD.

(2) Operation of Electrical Connector

[0064] Next, an operation of the electrical connector 100 according to the present embodiment will be described with reference to the drawings. Figs. 16 to 26 are views for describing an operation of the electrical connector 100 according to the present embodiment.

[0065] The electrical connector 100 charges a battery (not illustrated) mounted on a vehicle such as an electric vehicle (EV) or a hybrid electric vehicle (HEV) according to information (instruction) from a power supply unit (not illustrated) connected to an end portion of the electric wire W extending from the handle portion 115 to the outside, when being in a state of fitting to the power receiving connector 10.

(From Separating State to Fitting State)

[0066] As illustrated in Fig. 16, when the power receiving connector 10 and the electrical connector 100 are in a state of separating from each other, the lock claw 122 and the latch claw 132 protrude from the cutout 116 of the connector fitting portion 111. At this time, the latch piece 133 is latched to the second latch groove portion 143B of the lock release unit 140. Since the auxiliary latch piece 127 of the second lock unit 120B is provided on the separating direction SD side from the latch piece 133, the auxiliary latch piece 127 is in a state of being immediately latchable to the second latch groove portion 143B when the latching between the latch piece 133 and the second latch groove portion 143B is released while the auxiliary latch piece 127 is not in a state of being completely latched to the second latch groove portion 143B. In this separating state, the release switch 141 is in a state of being unoperatable.

[0067] Subsequently, as illustrated in Fig. 17, when the power receiving connector 10 and the electrical connector 100 are gradually fitted together, the hood portion 12 of the power receiving connector 10 retreats (presses) the lock claw 122 into the connector fitting portion 111. Then, the lock arm 121 swings, and thus the auxiliary latch piece 127 deviates from the second latch groove portion 143B. At this time, the latch piece 123 is inserted into the first latch groove portion 143A of the lock release unit 140.

[0068] Subsequently, as illustrated in Fig. 18, when the power receiving connector 10 and the electrical connector 100 are further fitted together, the hood portion 12 of the power receiving connector 10 presses the latch claw 132 into the connector fitting portion 111. Then, the latch arm 131 swings, and thus the latch piece 133 removes from the second latch groove portion 143B. Then, as illustrated in Fig. 19, the lock piece 123 is latched to the first latch groove portion 143A of the lock release unit 140, and the release switch 141 is yet in a state of being unoperatable.

[0069] Subsequently, as illustrated in Fig. 20, when the power receiving connector 10 and the electrical connector 100 are completely fitted together, the lock claw 122 protrudes from the cutout 116 of the connector fitting portion 111 in the hood portion 12 of the power receiving connector 10 to be latched to the power receiving connector 10, and the lock piece 123 removes from the first latch groove portion 143A of the lock release unit 140.

[0070] As illustrated in Figs. 20 and 21, the release switch 141 moves toward the separating direction SD because all the latching to the latch groove portion 143 is released. Accordingly, the regulation wall surface 145 of the lock release unit 140 located between the micro switch 151 and the movable shaft 153 moves to the separating direction SD side. Then, as illustrated in Fig. 22, the movable shaft 153 of the power feedability determining mechanism 150 protrudes along the width direction WD and presses the micro switch 151, thereby becoming a chargeable state.

(Charge Mode)

[0071] As illustrated in Fig. 23, in a charge mode, even when the release switch 141 is about to be moved in the fitting direction FD, the regulation wall surface 145 bumps against the movable shaft 153 abutting the micro switch 151. This may make it impossible to operate the release switch 141.

[0072] In addition, the regulation arm 154 is inserted into the air gap 123A of the lock arm 121 (see Fig. 10). Therefore, even when the release switch 141 is about to be moved in the fitting direction FD, the swing of the lock arm 121 can be prevented, so that the removal of the lock claw 122 from the connector housing 11 can be prevented.

[0073] Accordingly, the fitting of the power receiving connector 10 and the connector fitting portion 111 can be prevented from being accidentally released when charging the battery (not illustrated) mounted on the vehicle.

(From Fitting State to Separating State)

[0074] When the charging of the battery (not illustrated) mounted to the vehicle is completed, the movable shaft 153 of the solenoid 152 returns to the original state, so that the abutting between the micro switch 151 and the movable shaft 153 is released (see Fig. 13). Then, a gap occurs between the micro switch 151 and the movable shaft 153, and the regulation arm 154 retracts from the air gap 123A of the lock arm 121 (see Fig. 9). Accordingly, the lock release unit 140 is movable along the fitting direction FD.

[0075] Subsequently, as illustrated in Fig. 24, when the release switch 141 is pressed against the fitting direction FD side, the release body portion 142 of the lock release unit 140 abuts an inclined surface 121C of the lock arm 121 and slides on the inclined surface 121C. Then, since the lock arm 121 swings, the lock piece 123 is latched to the first latch groove portion 143A of the lock release unit 140 and the hold latch piece 162 of the release switch hold portion 160 is latched to the second latch groove portion 143B of the lock release unit 140. At this time, since the lock claw 122 is retracted into the connector fitting portion 111, the power receiving connector 10 and the electrical connector 100 can be separated from each other.

[0076] Subsequently, as illustrated in Figs. 25 and 26, when the power receiving connector 10 and the electrical connector 100 are gradually separated from each other, the latch arm 131 swings and the latch claw 132 protrudes from the cutout 116 of the connector fitting portion 111, so that the latch piece 133 is latched to the second latch groove portion 143B of the lock release unit 140. At this time, the protrusion 131A of the latch arm 131 swings the hold arm 161 such that the fitting direction FD side is located in the bottom direction BD to be lower than the hold arm shaft 163 of the hold arm 161. Accordingly, the hold latch piece 162 of the release switch hold portion 160 removes from the second latch groove portion 143B of the lock release unit 140.

[0077] Then, when the power receiving connector 10 and the electrical connector 100 are completely separated from each other, the lock claw 122 protrudes from the cutout 116 of the connector fitting portion 111 (see Fig. 16). Simultaneously, the lock piece 123 removes from the first latch groove portion 143A of the lock release unit 140, and the auxiliary latch piece 127 is in a state of being latchable to the second latch groove portion 143B of the lock release unit 140.

(3) Operation and Effect

[0078] In the above-described embodiment, while the lock claw 122 is in a state of retracting into the connector fitting portion 111, the lock arm 121 and the auxiliary arm 126 swing, so that the latching of the auxiliary latch piece 127 to the second latch groove portion 143B is released. In addition, the latch claw 132 is provided on the nearer side than the lock claw 122 in the fitting direction FD of the connector fitting portion 111 to the power receiving connector 10. While the latch claw 132 is in a state of retracting into the connector fitting portion 111, the latch arm 131 swings, so that the latching between the latch piece 133 and the second latch groove portion 143B is released. Accordingly, the latch claw 132 is retracted into the connector fitting portion 111 by the abutting on the hood portion 12 of the power receiving connector 10 to be later than the lock claw 122. Therefore, the latching between the latch piece 133 and the second latch groove portion 143B by the swing of the latch claw 132 is not released unless the latching between the auxiliary latch piece 127 and the second latch groove portion 143B by the swing of the auxiliary arm 126 is released.

[0079] That is, when only the latching between the auxiliary latch piece 127 and the second latch groove portion 143B by the swing of the auxiliary arm 126 is released, the power receiving connector 10 and the connector fitting portion 111 are not in a state of completely fitting together, and thus the release switch 141 does not protrude from the connector case 110 and is yet unoperatable. On the other hand, when the latching between the lock piece 123 or the auxiliary latch piece 127 and the latch groove portion 143 is released and also the latching between the latch piece 133 and the second latch groove portion 143B is released, the power receiving connector 10 and the connector fitting portion 111 are in a state of completely fitting together, and thus the release switch 141 protrudes from the connector case 110 and is operatable. Accordingly, the fitting state between the power receiving connector 10 and the connector fitting portion 111 can be detected according to the positional state of the release switch 141. Therefore, the battery can be prevented from being charged in the half-fitting state, thus making it possible to improve stability more securely.

[0080] In the present embodiment, the latch claw 132 is provided with the lock claw 122 along the fitting direction FD. Accordingly, for example, when the connector housing 11 or the hood portion 12 of the power receiving connector 10 is damaged, even when the lock claw 122 does not abut the hood portion 12 of the power receiving connector 10 and only the latch claw 132 abuts the hood portion 12 and is retracted into the connector fitting portion 111, the latching between the lock piece 123 or the

auxiliary latch piece 127 and the latch groove portion 143 is not released. Therefore, when the power receiving connector 10 and the connector fitting portion 111 are not in a state of completely fitting together (that is, when the lock claw 122 is not locked to the connector housing 11), the release switch 141 does not protrude from the connector case 110 and can be made unoperatable.

[0081] In the present embodiment, the lock piece 123 is provided at a position facing the auxiliary latch piece 127. Accordingly, the lock piece 123 and the auxiliary latch piece 127 can be latched to the latch groove portion 143 (first latch groove portion 143A and second latch groove portion 143B) of the lock release unit 140, thus making it possible to provide double locking. Therefore, even when the latching between the auxiliary latch piece 127 and the second latch groove portion 143B is released, the release switch 141 does not protrude from the connector case 110 and is unoperatable until the latching between the lock piece 123 and the first latch groove portion 143A is released. Accordingly, the abrupt protrusion of the release switch 141 from the connector case 110 can be securely prevented.

[0082] In the present embodiment, while the lock claw 122 is in a state of retracting into the connector fitting portion 111, the lock arm 121 swings and the lock piece 123 is latched to the first latch groove portion 143A. While the lock claw 122 is in a state of protruding from the connector fitting portion 111, the lock arm 121 swings and the latching of the lock piece 123 to the first latch groove portion 143A is released. That is, the latching between the lock piece 123 and the first latch groove portion 143A by the swing of the lock arm 121 is not released unless the lock claw 122 protrudes from the connector fitting portion 111 (that is, unless the lock claw 122 is locked to the power receiving connector 10). Therefore, until the lock claw 122 is locked to the power receiving connector 10, the release switch 141 does not protrude from the connector case 110 and can be made unoperatable, thus making it possible to improve safety more securely.

[0083] In the present embodiment, the width W2 of the latch claw 132 is smaller than the width W1 of the lock claw 122. Accordingly, it is possible to prevent the case where the lock claw 122 is not retracted into the connector fitting portion 111 and only the latch claw 132 is abruptly retracted into the connector fitting portion 111.

[0084] In the present embodiment, the regulation wall surface 145 is provided under the release body portion 142, and is movable in the fitting/separating direction FSD between the micro switch 151 and the movable shaft 153 of the power feedability determining mechanism 150. Accordingly, when the release switch 141 protrudes from the connector case 110 and is operatable, the regulation wall surface 145 retracts from the portion between the micro switch 151 and the movable shaft 153. Therefore, unless the power receiving connector 10 and the connector fitting portion 111 are not completely fitted together, the micro switch 151 is not turned on, and the battery can be prevented from being charged.

[0085] Also, in a charge mode, even when the release switch 141 is about to be moved in the fitting direction FD, the regulation wall surface 145 bumps against the movable shaft 153 abutting the micro switch 151. Therefore, in the charge mode, the release switch 141 can be prevented from moving in the fitting direction FD, so that the operation of the release switch 141 can be prevented. That is, in the charge mode, the lock claw 122 can be prevented from being removed and released from the power receiving connector 10, so that the power receiving connector 10 and the connector fitting portion 111 can be prevented from be separated from each other due to a fitting error thereof.

[0086] In the present embodiment, the regulation arm 154 is insertable/extractable into/from the air gap 123A of the lock arm 121 according to the movement of the movable shaft 153, and is inserted into the air gap 123A to regulate the swing of the lock arm 121. Accordingly, the lock arm 121 does not swing when the lock claw 122 is in a state of protruding from the connector fitting portion 111. Therefore, the fitting of the power receiving connector 10 and the connector fitting portion 111 can be prevented from be accidentally released during charging.

[0087] In the present embodiment, the electrical connector 100 further includes the release switch hold portion 160 that holds the position of the lock release unit 140 while the release switch 141 is in a state of being pressed. Accordingly, even when the release switch 141 is not continuously pressed in the fitting direction FD, the release switch 141 does not protrude from the connector case 110 and can be held in an unoperatable state. Accordingly, the operability is improved because an operator need not perform the operation while pressing the release switch 141.

[0088] In addition, the latch arm 131 includes the protrusion 131A that releases the latching between the hold latch piece 162 and the second latch groove portion 143B when the latch piece 133 and the second latch groove portion 143B are latched together. That is, while the release switch 141 does not protrude from the connector case 110, the latching between the hold latch piece 162 and the second latch groove portion 143B is released and the latch piece 133 and the second latch groove portion 143B are latched together. Therefore, the release switch 141 can be prevented from protruding from the connector case 110 accidentally when the connector fitting portion 111 is separated from the power receiving connector 10.

(4) Other Embodiments

[0089] Although the present invention has been described based on the above embodiments, it should not be understood that the statements and the drawings constituting a part of this disclosure limit the present invention. From this disclosure, various alternative embodiments, examples, and operation techniques will become apparent to those skilled in the art.

[0090] For example, the embodiments of the present invention may be changed as follows. Specifically, although the electrical connector 100 has been described as a connector charging a battery (not illustrated) mounted on a vehicle such as an electric vehicle (EV) or a hybrid electric vehicle (HEV), the present invention is not limited thereto. The electrical connector 100 may be used to charge other batteries.

[0091] Also, although the respective arms have been described as being biased by coil springs as bias members, the present invention is not limited thereto. The respective arms may be biased by other springs, cylinders, or the like.

[0092] Also, the respective configurations of the electrical connector 100 are not limited to the description in the present embodiment, and may be any other configurations that can be implemented. For example, it is only required that the electrical connector 100 includes at least the connector case 110, the lock mechanism 120, the fitting detecting mechanism 130, and the lock release unit 140. The electrical connector 100 may not include the power feedability determining mechanism 150 and the release switch hold portion 160.

[0093] As described above, the present invention naturally includes various embodiments that are not described herein. Accordingly, the technical scope of the present invention should be only determined according to the subject matter recited in the scope of claims regarded as appropriate based on the above description.

Claims

1. An electrical connector (100) comprising:

a connector case (110) including a connector fitting portion (111) configured to fit to a power receiving connector (10) and accommodating an electric wire (W);
a power feeding terminal (111A) provided in the connector fitting portion (111) and connected to the electric wire (W), the power feeding terminal (111A) being configured to be connected to a power receiving terminal (11A) of the power receiving connector (10) in a fitting state where the power receiving connector (10) and the connector fitting portion (111) are fitted together;
a lock mechanism (120) configured to prevent the power receiving connector (10) and the connector fitting portion (111) from being separated from each other in the fitting state between the power receiving connector (10) and the connector fitting portion (111);
a fitting detecting mechanism (130) configured to detect the fitting state between the power receiving connector (10) and the connector fitting portion (111); and
a lock release unit (140) including an operating portion (141) advanceable from and retractable to the connector case (110), and a latch portion (143, 143B) configured to latch to a portion of the lock mechanism (120) and a portion of the fitting detecting mechanism (130) with the operating portion (141) being retracted to the connector case (110),
wherein, upon release of the latching of the latch portion (143, 143B) in the fitting state between the power receiving connector (10) and the connector fitting portion (111), the operating portion (141) of the lock release unit (140) is configured to move in a direction where the operating portion (141) advances from the connector case (110) and become operatable to enable release of the fitting state between the power receiving connector (10) and the connector fitting portion (111),
wherein the lock mechanism (120) comprises a first lock unit (120A) including
a lock arm (121) swingably provided in the connector case (110), and
a lock claw (122) provided at one end of the lock arm (121) at a side of the power receiving connector (10) and being protrudable and retractable from the connector fitting portion(111), and
characterized in that, the lock mechanism further comprises:

a second lock unit (120B) including
an auxiliary arm (126) connected to the lock arm (121), and
an auxiliary latch piece (127) provided at an end of the auxiliary arm (126) and configured to latch to the latch portion (143, 143B) of the lock release unit (140),

wherein the latching of the auxiliary latch piece (127) to the latch portion (143, 143B) of the lock release unit (140) is released with the lock claw (122) being retracted in the connector fitting portion (111) by swing of the lock arm (121) and the auxiliary arm (126),
wherein the fitting detecting mechanism (130) includes
a latch arm (131) swingably provided in the connector case (110),
a latch claw (132) provided at one end of the latch arm (131) at a side of the power receiving connector (10) and being protrudable and retractable from the connector fitting portion (111), and
a latch piece (133) provided at the other end of the latch arm (131) and being latchable to the latch portion (143, 143B) of the lock release unit (143),
wherein the latch claw (132) is provided at a nearer side than the lock claw (122) in a fitting

direction where the connector fitting portion (111) is fitted to the power receiving connector (10), and
wherein the latching of the latch piece (133) to the latch portion (143, 143B) of the lock release unit (140) is released with the latch claw (132) being retracted in the connector fitting portion (111) by swing of the latch arm (131).

2. The electrical connector (100) according to claim 1, wherein the latch claw (132) is provided with the lock claw (122) along the fitting direction.

3. The electrical connector (100) according to claim 1 or 2, wherein

the first lock unit (120A) includes a lock piece (123) provided at the other end of the lock arm (121) and being latchable to the latch portion (143, 143B) of the lock release unit (140), and
the lock piece (123) is provided at a position facing the auxiliary latch piece (127).

4. The electrical connector (100) according to any one of claims 1 to 3, wherein

the first lock unit (120A) includes
a lock arm shaft (124) configured to pivotally support the lock arm (121) to be swingable, and
a lock arm bias member (125) configured to bias the lock arm (121) in a direction where the lock claw (122) protrudes from the connector fitting portion (111),
the fitting detecting mechanism (130) includes
a latch arm shaft (134) configured to pivotally support the latch arm (131) to be swingable, and
a latch arm bias member (135) configured to bias the latch arm (131) in a direction where the latch claw (132) protrudes from the connector fitting portion (111), and
the lock release unit (140) includes a release bias member (144) configured to bias the lock release unit (140) in the direction where the operating portion (141) advances from the connector case (110).

Patentansprüche

1. Elektrischer Steckverbinder (100), umfassend:

ein Steckverbindergehäuse (110), das einen Steckverbinderpassabschnitt (111) einschließt, der konfiguriert ist, zu einem Energieempfangssteckverbinder (10) zu passen und einen elektrischen Draht (W) aufzunehmen;
einen Energiezufuhranschluss (111A), der in dem Steckverbinderpassabschnitt (111) bereitgestellt und mit dem elektrischen Draht (W) verbunden ist, wobei der Energiezufuhranschluss (111A) konfiguriert ist, mit einem Energieempfangsanschluss (11A) des Energieempfangssteckverbinders (10) in einem Passzustand verbunden zu werden, in dem der Energieempfangssteckverbinder (10) und der Steckverbinderpassabschnitt (111) zusammengefügt sind;
einen Sperrmechanismus (120), der konfiguriert ist, zu verhindern, dass der Energieempfangssteckverbinder (10) und der Steckverbinderpassabschnitt (111) im Passzustand zwischen dem Energieempfangssteckverbinder (10) und dem Steckverbinderpassabschnitt (111) voneinander getrennt werden;
einen Passzustandserfassungsmechanismus (130), der konfiguriert ist, den Passzustand zwischen dem Energieempfangssteckverbinder (10) und dem Steckverbinderpassabschnitt (111) zu erfassen; und
eine Entsperreinheit (140), die einen Betätigungsabschnitt (141), der aus dem Steckverbindergehäuse (110) ausfahrbar und wieder dorthin einfahrbar ist, und einen Einrastabschnitt (143, 143B) einschließt, der konfiguriert ist, in einen Abschnitt des Sperrmechanismus (120) und einen Abschnitt des Passzustandserfassungsmechanismus (130) einzurasten, wenn der Betätigungsabschnitt (141) in das Steckverbindergehäuse (110) eingefahren ist,
wobei bei Lösung des Einrastzustands des Einrastabschnitts (143, 143B) im Passzustand zwischen dem Energieempfangssteckverbinder (10) und dem Steckverbinderpassabschnitt (111) der Betätigungsabschnitt (141) der Entsperreinheit (140) konfiguriert ist, sich in eine Richtung zu bewegen, wobei der Betätigungsabschnitt (141) aus dem Steckverbindergehäuse (110) ausfährt und so betätigbar wird, um Lösen des Passzustands zwischen dem Energieempfangssteckverbinder (10) und dem Steckverbinderpassabschnitt (111) zu ermöglichen,
wobei der Sperrmechanismus (120) eine erste Sperreinheit (120A) umfasst, einschließend
einen Sperrarm (121), der schwenkbar in dem Steckverbindergehäuse (110) bereitgestellt ist, und
eine Sperrkralle (122), die an einem Ende des Sperrarms (121) auf einer Seite des Energieempfangssteckverbinders (10) bereitgestellt und aus dem Steckverbinderpassabschnitt (111) vorschiebbar und einfahrbar ist, und
dadurch gekennzeichnet, dass der Sperrmechanismus weiter umfasst:

eine zweite Sperreinheit (120B), einschließend
einen Hilfsarm (126), der mit dem Sperrarm

(121) verbunden ist, und
ein Hilfseinraststück (127), das an einem Ende des Hilfsarms (126) bereitgestellt und konfiguriert ist, in den Einrastabschnitt (143, 143B) der Entsperreinheit (140) einzurasten,

wobei das Einrasten des Hilfseinraststücks (127) in den Einrastabschnitt (143, 143B) der Entsperreinheit (140) gelöst wird, wenn die Sperrkralle (122) durch Schwenken des Sperrarms (121) und des Hilfsarms (126) in den Steckverbinderpassabschnitt (111) eingefahren ist,
wobei der Passzustandserfassungsmechanismus (130) einschließt
einen Einrastarm (131), der schwenkbar in dem Steckverbindergehäuse (110) bereitgestellt ist,
eine Einrastkralle (132), die an einem Ende des Einrastarms (131) auf einer Seite des Energieempfangssteckverbinders (10) bereitgestellt und aus dem Steckverbinderpassabschnitt (111) vorschiebbar und einfahrbar ist, und
ein Einraststück (133), das an dem anderen Ende des Einrastarms (131) bereitgestellt und in den Einrastabschnitt (143, 143B) der Entsperreinheit (143) einrastbar ist,
wobei die Einrastkralle (132) in einer Passrichtung, in der der Steckverbinderpassabschnitt (111) mit dem Energieempfangssteckverbinder (10) zusammenpasst, auf einer näheren Seite bereitgestellt ist als die Sperrkralle (122) und
wobei das Einrasten des Einraststücks (133) in den Einrastabschnitt (143, 143B) der Entsperreinheit (140), wenn die Einrastkralle (132) durch Schwenken des Einrastarms in den Steckverbinderpassabschnitt (111) eingefahren ist, (131) gelöst wird.

2. Elektrischer Steckverbinder (100) nach Anspruch 1, wobei die Einrastkralle (132) mit der Sperrkralle (122) entlang der Passrichtung bereitgestellt ist.

3. Elektrischer Steckverbinder (100) nach Anspruch 1 oder 2, wobei
die erste Sperreinheit (120A) ein Sperrstück (123) einschließt, das an dem anderen Ende des Sperrarms (121) bereitgestellt und in den Einrastabschnitt (143, 143B) der Entsperreinheit (140) einrastbar ist, und
das Sperrstück (123) an einer dem Hilfseinraststück (127) zugewandten Position bereitgestellt ist.

4. Elektrischer Steckverbinder (100) nach einem der Ansprüche 1 bis 3, wobei
die erste Sperreinheit (120A) einschließt
eine Sperrarmwelle (124), die konfiguriert ist, den Sperrarm (121) zentral zu stützen, sodass er schwenkbar ist, und
ein Sperrarmvorspannelement (125), das konfiguriert ist, den Sperrarm (121) in eine Richtung vorzuspannen, in die die Sperrkralle (122) aus dem Steckverbinderpassabschnitt (111) vorragt,
der Passzustandserfassungsmechanismus (130) einschließt
eine Einrastarmwelle (134), die konfiguriert ist, den Einrastarm (131) zentral zu stützen, sodass er schwenkbar ist, und
ein Einrastarmvorspannelement (135), das konfiguriert ist, den Einrastarm (131) in eine Richtung vorzuspannen, in die die Einrastkralle (132) aus dem Steckverbinderpassabschnitt (111) vorragt, und
die Entsperreinheit (140) ein Lösungsvorspannelement (144) einschließt, das konfiguriert ist, die Entsperreinheit (140) in die Richtung vorzuspannen, in die der Betätigungsabschnitt (141) aus dem Steckverbindergehäuse (110) ausfährt.

Revendications

1. Connecteur électrique (100) comprenant :

un boîtier de connecteur (110) comprenant une portion de montage de connecteur (111) configurée pour être montée sur un connecteur de réception de puissance (10) et logeant un fil électrique (W) ;
une borne d'alimentation en puissance (111A) prévue dans la portion de montage de connecteur (111) et connectée au fil électrique (W), la borne d'alimentation en puissance (111A) étant configurée pour être connectée à une borne de réception de puissance (11A) du connecteur de réception de puissance (10) dans un état de montage où le connecteur de réception de puissance (10) et la portion de montage de connecteur (111) sont montés ensemble ;
un mécanisme de verrouillage (120) configuré pour empêcher le connecteur de réception de puissance (10) et la portion de montage de connecteur (111) d'être séparés l'un de l'autre dans l'état de montage entre le connecteur de réception de puissance (10) et la portion de montage de connecteur (111) ;
un mécanisme de détection de montage (130) configuré pour détecter l'état de montage entre le connecteur de réception de puissance (10) et la portion de montage de connecteur (111) ; et
une unité de déverrouillage (140) comprenant une portion de commande (141) pouvant être avancée à partir du boîtier de connecteur (110) et rétractée vers celui-ci, et une portion d'enclenchement (143, 143B) configurée pour s'enclencher avec une portion du mécanisme de verrouillage (120) et une portion du mécanisme de

détection de montage (130) avec la portion de commande (141) qui est rétractée vers le boîtier de connecteur (110),
dans lequel, lors de la libération de l'enclenchement de la portion d'enclenchement (143, 143B) dans l'état de montage entre le connecteur de réception de puissance (10) et la portion de montage de connecteur (111), la portion de commande (141) de l'unité de déverrouillage (140) est configurée pour se déplacer dans une direction où la portion de commande (141) avance à partir du boîtier de connecteur (110) et devient utilisable pour permettre de défaire l'état de montage entre le connecteur de réception de puissance (10) et la portion de montage de connecteur (111),
dans lequel le mécanisme de verrouillage (120) comprend une première unité de verrouillage (120A) comprenant
un bras de verrouillage (121) prévu de manière oscillante dans le boîtier de connecteur (110), et une griffe de verrouillage (122) prévue à une extrémité du bras de verrouillage (121) au niveau d'un côté du connecteur de réception de puissance (10) et pouvant faire saillie et être rétractée de la portion de montage de connecteur (111), et
caractérisé en ce que le mécanisme de verrouillage comprend en outre :

une deuxième unité de verrouillage (120B) comprenant
un bras auxiliaire (126) connecté au bras de verrouillage (121), et
une pièce d'enclenchement auxiliaire (127) prévue à une extrémité du bras auxiliaire (126) et configurée pour s'enclencher avec la portion d'enclenchement (143, 143B) de l'unité de déverrouillage (140),

dans lequel l'enclenchement de la pièce d'enclenchement auxiliaire (127) avec la portion d'enclenchement (143, 143B) de l'unité de déverrouillage (140) est défait avec la griffe de verrouillage (122) qui est rétractée dans la portion de montage de connecteur (111) par une oscillation du bras de verrouillage (121) et du bras auxiliaire (126),
dans lequel le mécanisme de détection de montage (130) comprend
un bras d'enclenchement (131) prévu de manière oscillante dans le boîtier de connecteur (110),
une griffe d'enclenchement (132) prévue à une extrémité du bras d'enclenchement (131) au niveau d'un côté du connecteur de réception de puissance (10) et pouvant faire saillie et être rétractée de la portion de montage de connecteur (111), et
une pièce d'enclenchement (133) prévue à l'autre extrémité du bras d'enclenchement (131) et pouvant être enclenchée avec la portion d'enclenchement (143, 143B) de l'unité de déverrouillage (143),
dans lequel la griffe d'enclenchement (132) est prévue au niveau d'un côté plus proche que la griffe de verrouillage (122) dans une direction de montage où la portion de montage de connecteur (111) est montée sur le connecteur de réception de puissance (10), et
dans lequel l'enclenchement de la pièce d'enclenchement (133) avec la portion d'enclenchement (143, 143B) de l'unité de déverrouillage (140) est défait avec la griffe d'enclenchement (132) qui est rétractée dans la portion de montage de connecteur (111) par une oscillation du bras d'enclenchement (131).

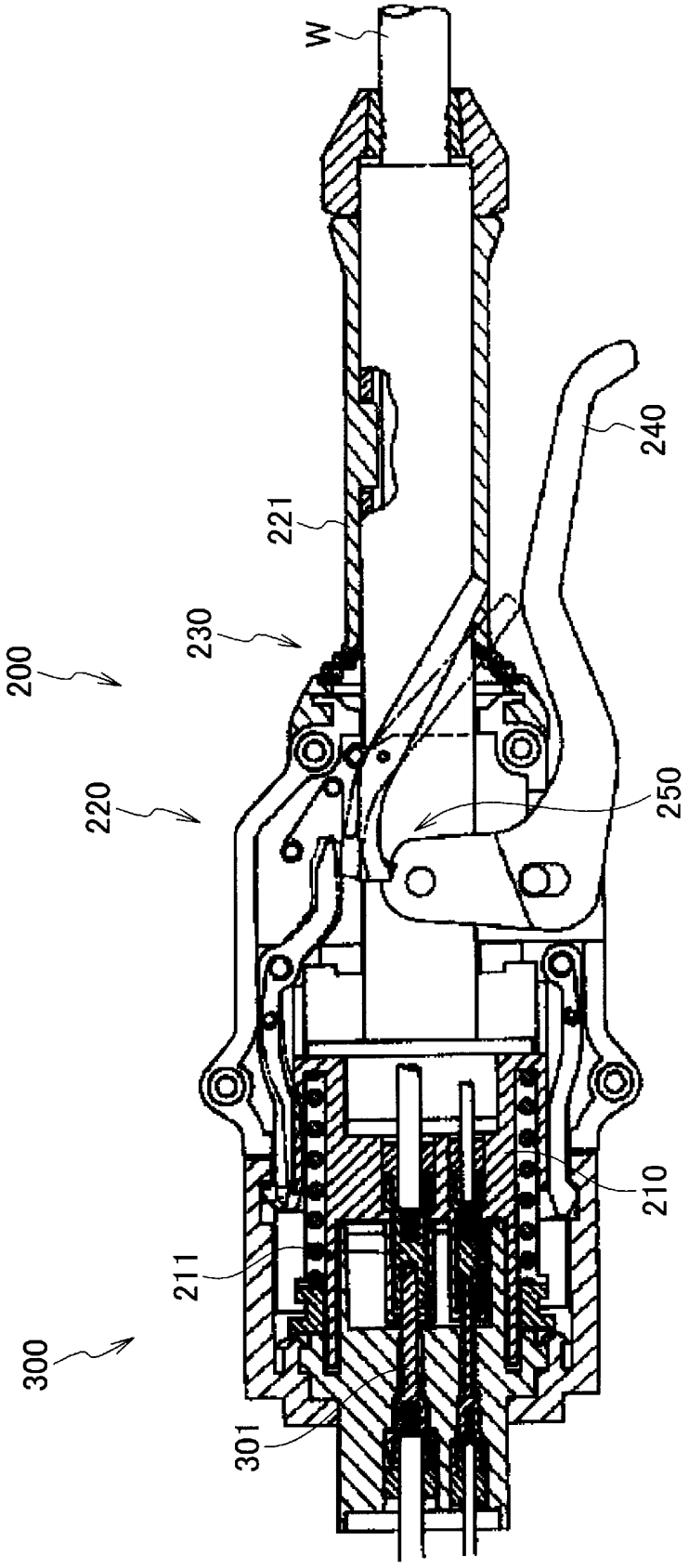
2. Connecteur électrique (100) selon la revendication 1, dans lequel la griffe d'enclenchement (132) est dotée de la griffe de verrouillage (122) le long de la direction de montage.

3. Connecteur électrique (100) selon la revendication 1 ou 2, dans lequel
la première unité de verrouillage (120A) comprend une pièce de verrouillage (123) prévue à l'autre extrémité du bras de verrouillage (121) et qui peut être enclenchée avec la portion d'enclenchement (143, 143B) de l'unité de déverrouillage (140), et
la pièce de verrouillage (123) est prévue au niveau d'une position faisant face à la pièce d'enclenchement auxiliaire (127).

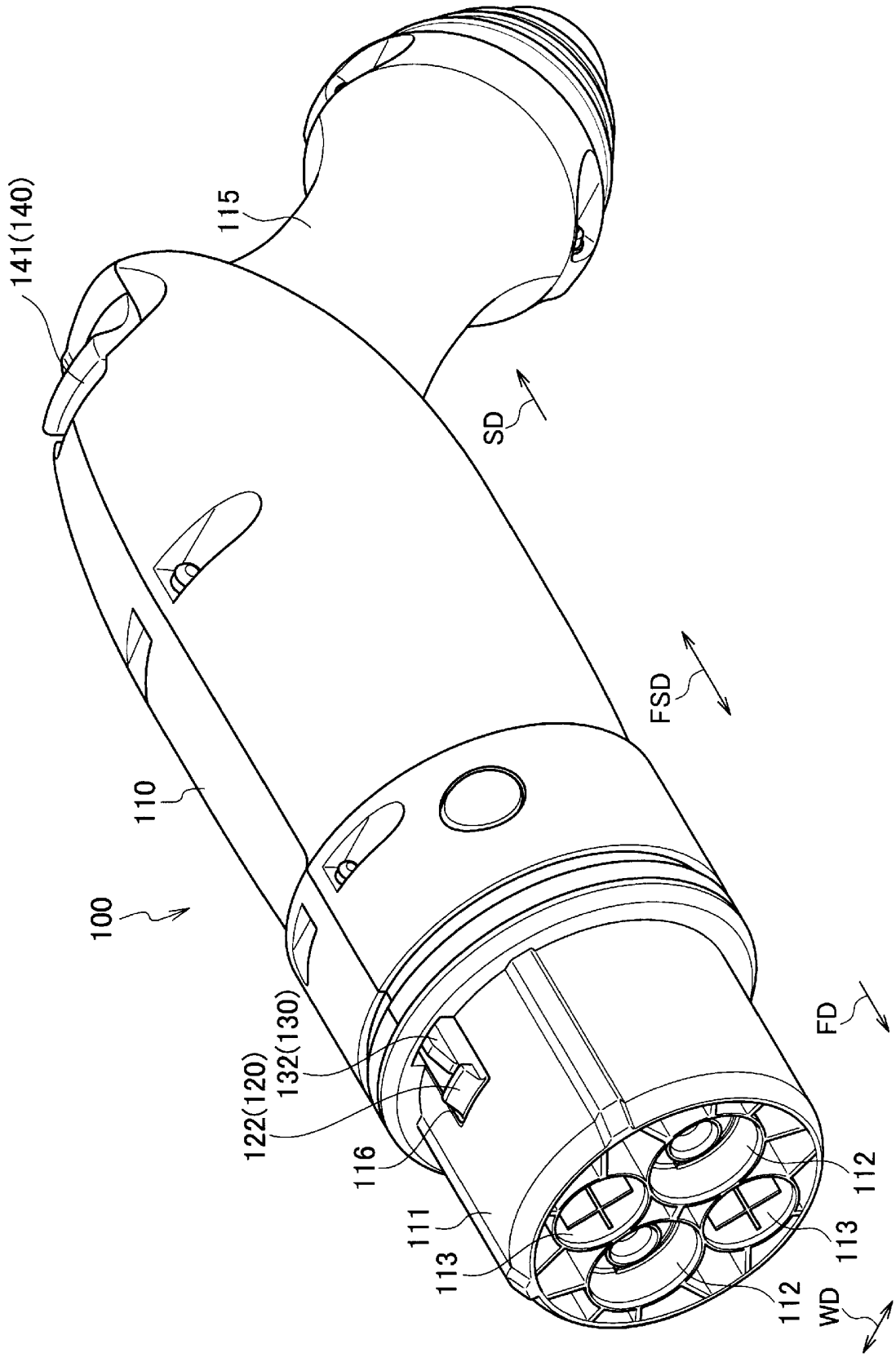
4. Connecteur électrique (100) selon l'une quelconque des revendications 1 à 3, dans lequel
la première unité de verrouillage (120A) comprend
une tige de bras de verrouillage (124) configurée pour supporter de manière pivotante le bras de verrouillage (121) pour qu'il puisse osciller, et
un élément d'inclinaison de bras de verrouillage (125) configuré pour incliner le bras de verrouillage (121) dans une direction où la griffe de verrouillage (122) fait saillie de la portion de montage de connecteur (111),
le mécanisme de détection de montage (130) comprend
une tige de bras d'enclenchement (134) configurée pour supporter de manière pivotante le bras d'enclenchement (131) pour qu'il puisse osciller, et
un élément d'inclinaison de bras d'enclenchement (135) configuré pour incliner le bras d'enclenchement (131) dans une direction où la griffe d'enclenchement (132) fait saillie de la portion de montage de connecteur (111), et
l'unité de déverrouillage (140) comprend un élément d'inclinaison de déverrouillage (144) configuré pour

incliner l'unité de déverrouillage (140) dans la direction où la portion de commande (141) avance à partir du boîtier de connecteur (110).

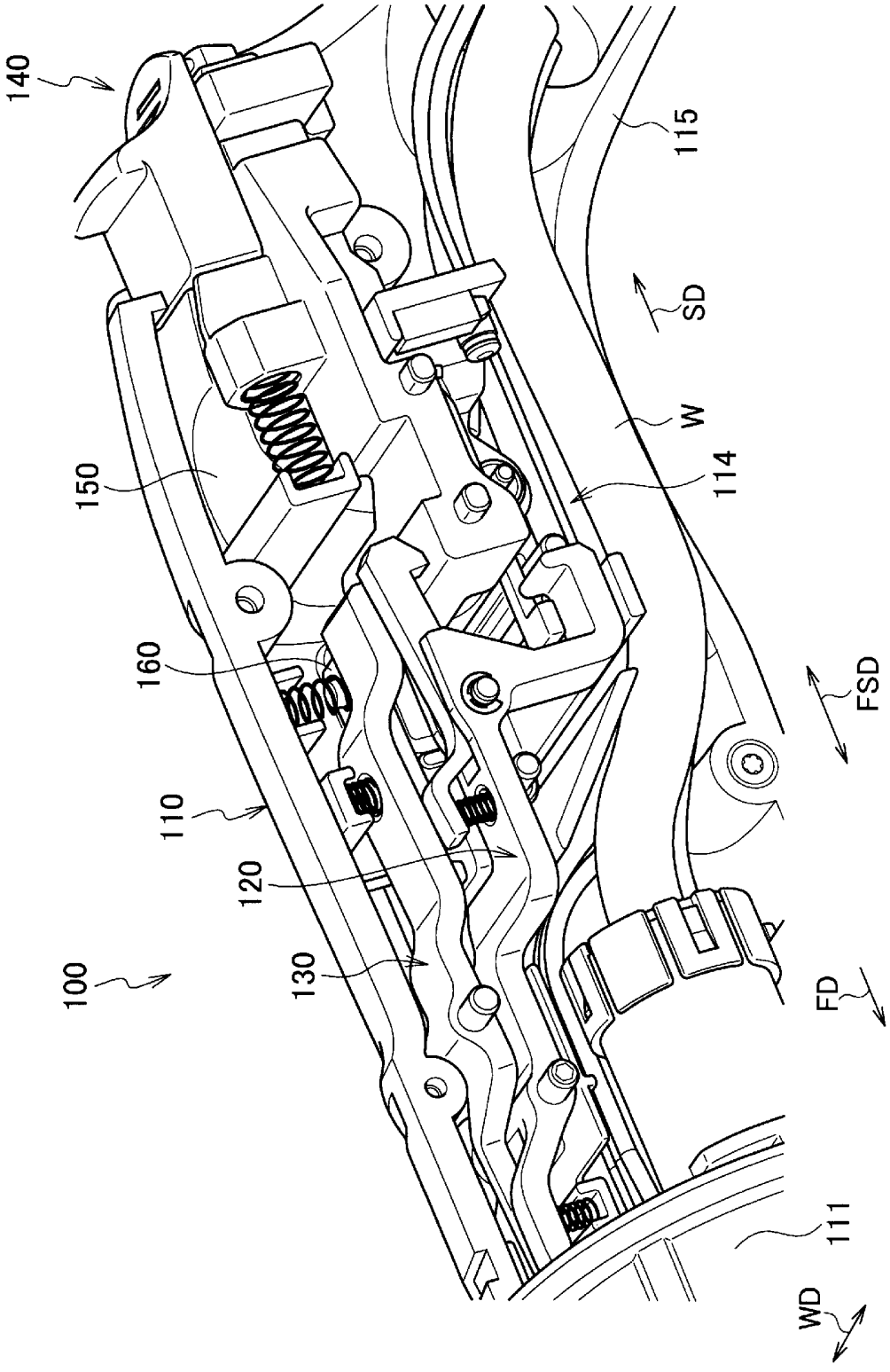
[Fig. 1]



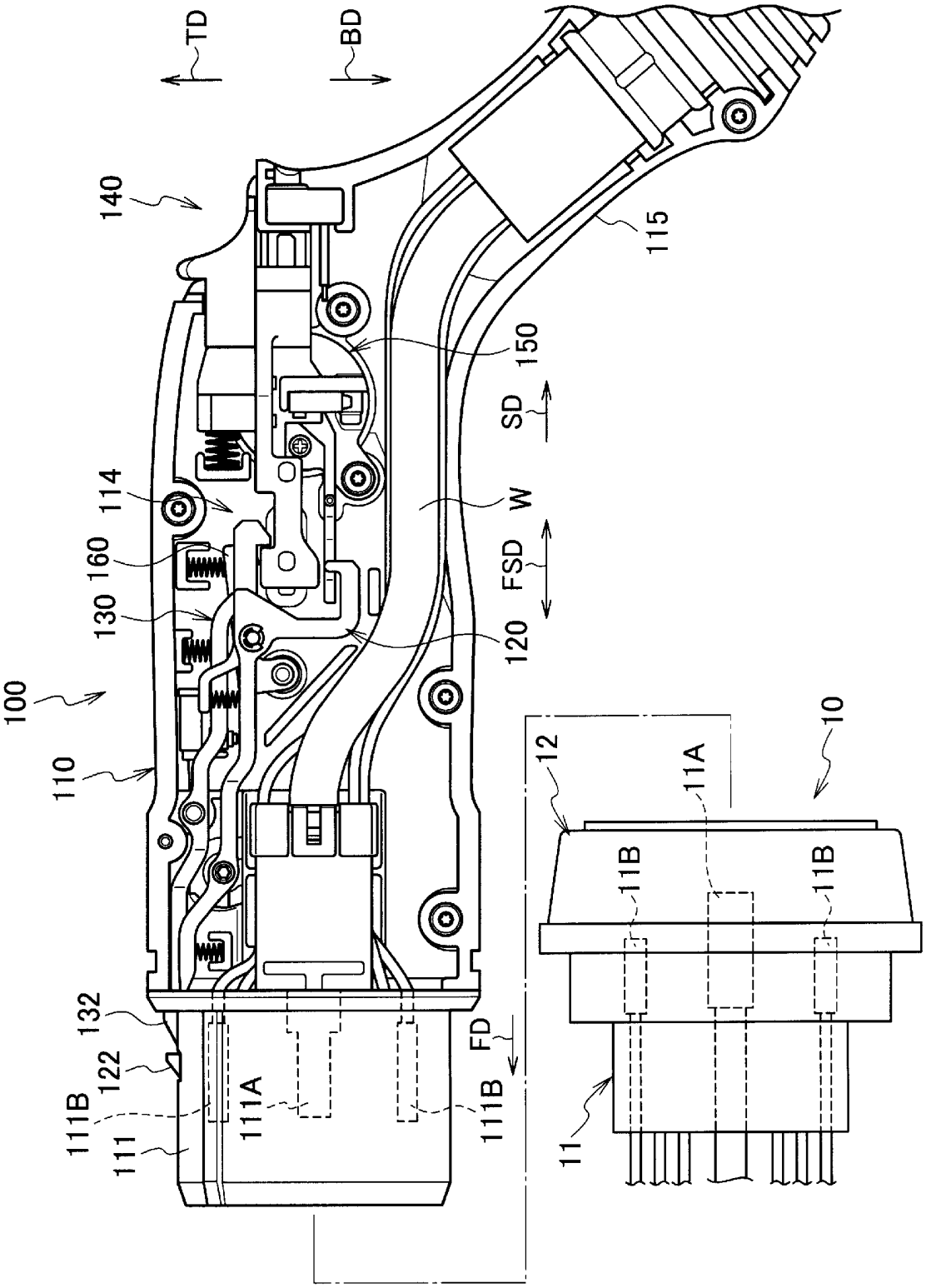
[Fig. 2]


141(140)
115
SD
FSD
110
100
FD
132(130)
122(120)
116
111
113
112
113
112
WD

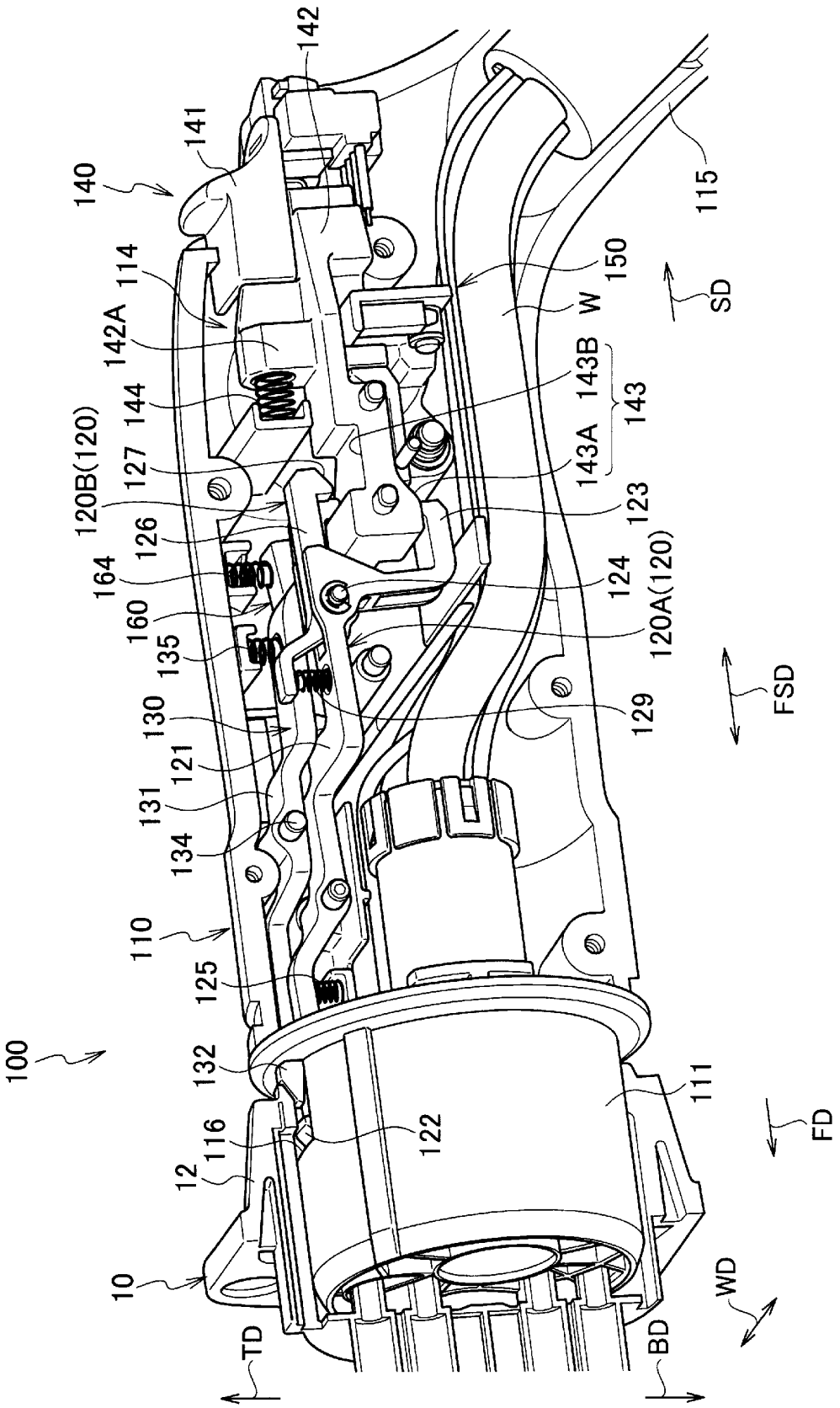
[Fig. 3]



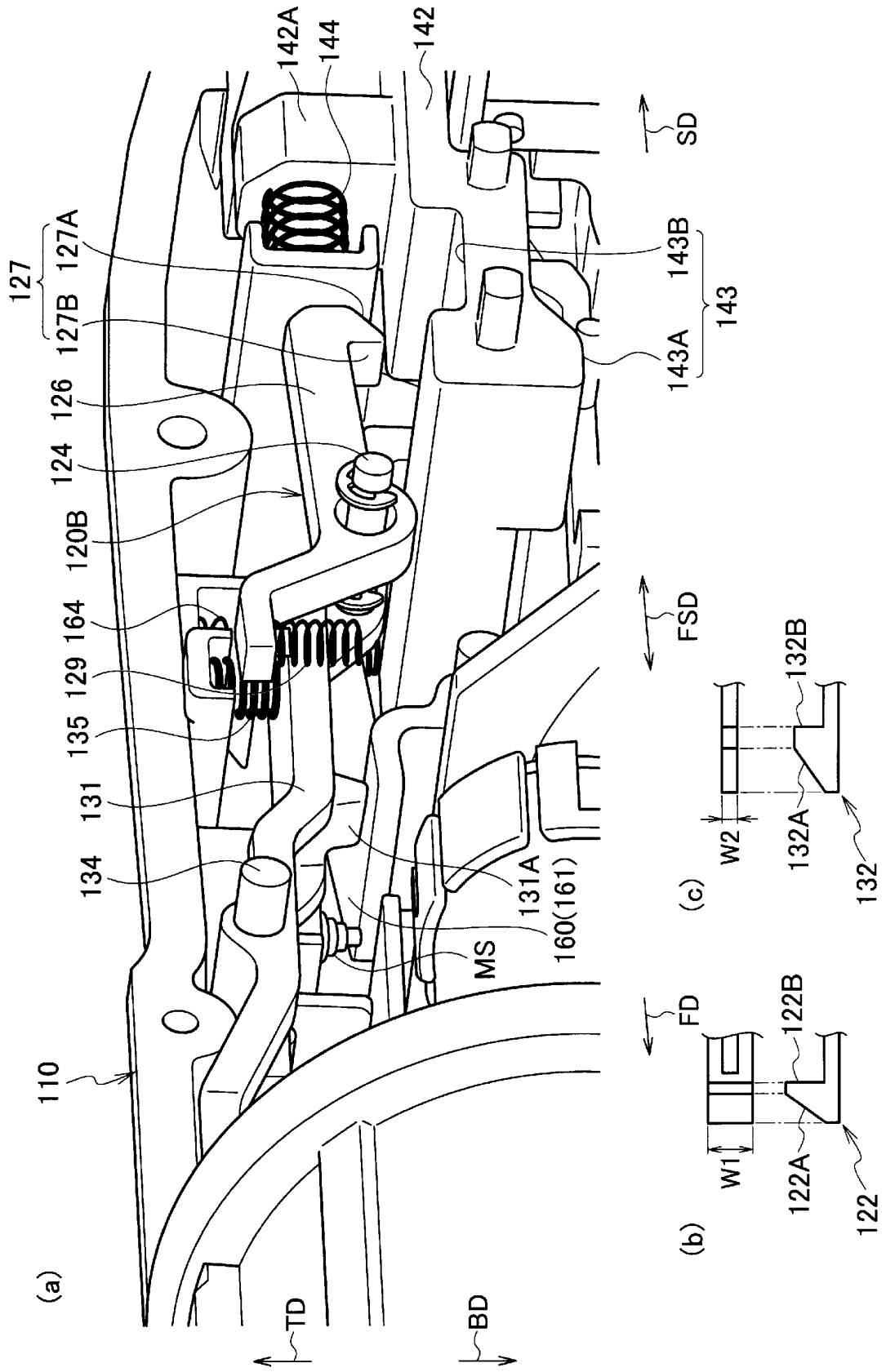
[Fig. 4]


TD
BD
140
115
150
SD
W
FSD
114
160
130
120
100
110
10
12
11A
11B
11B
132
122
111B
111
111A
FD
111B
11

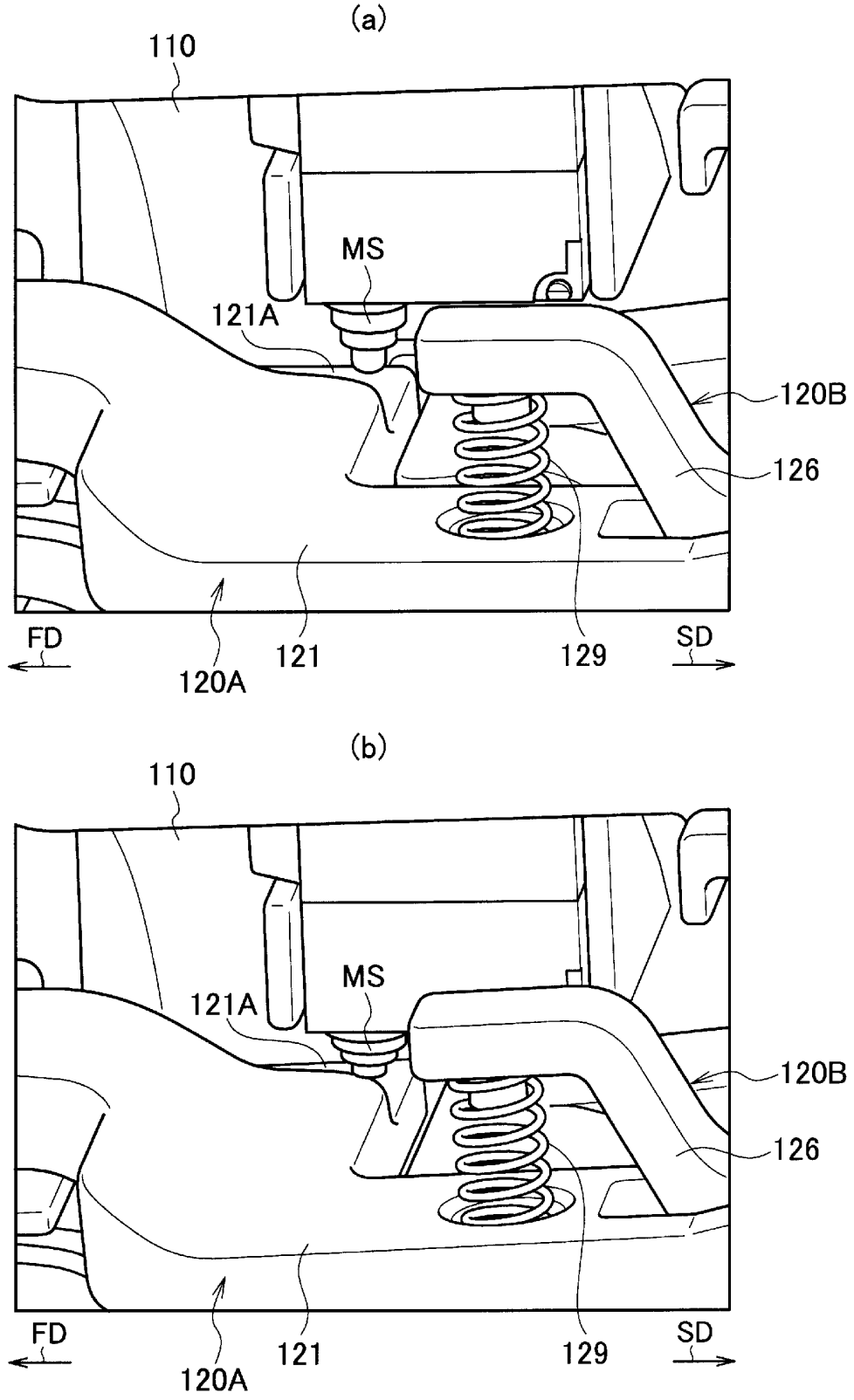
[Fig. 5]


142
141
140
115
114
150
W
SD
142A
143B
143
144
143A
120B(120)
127
123
126
124
164
120A(120)
160
135
FSD
129
130
121
131
134
110
125
100
132
111
116
122
FD
12
10
WD
TD
BD

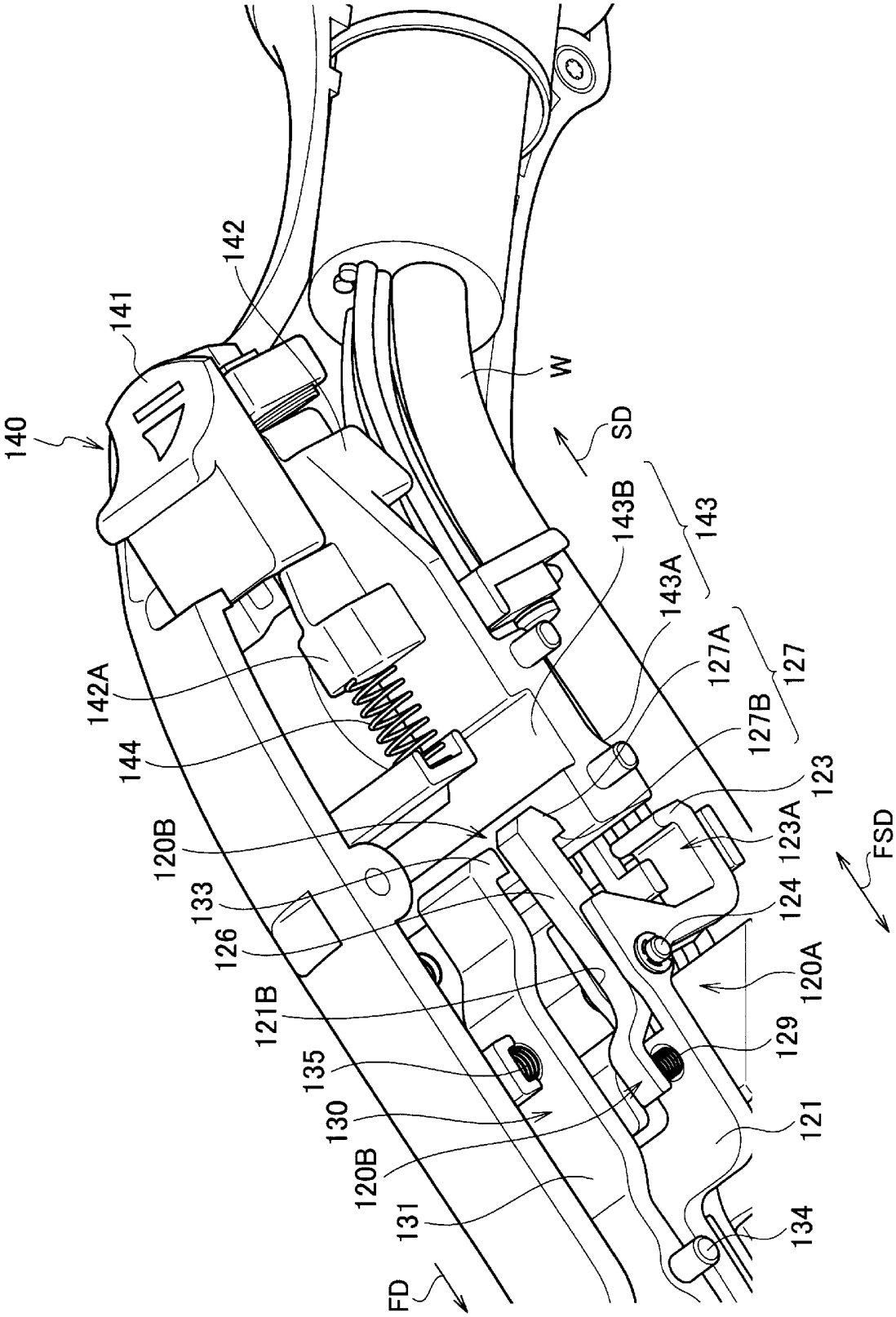
[Fig. 6]


142A
144
142
SD
127
127A
127B
126
124
120B
164
129
135
131
134
110
143B
143
143A
FSD
132B
W2
132A
132
(c)
131A
160(161)
MS
FD
122B
W1
122A
122
(b)
(a)
TD
BD

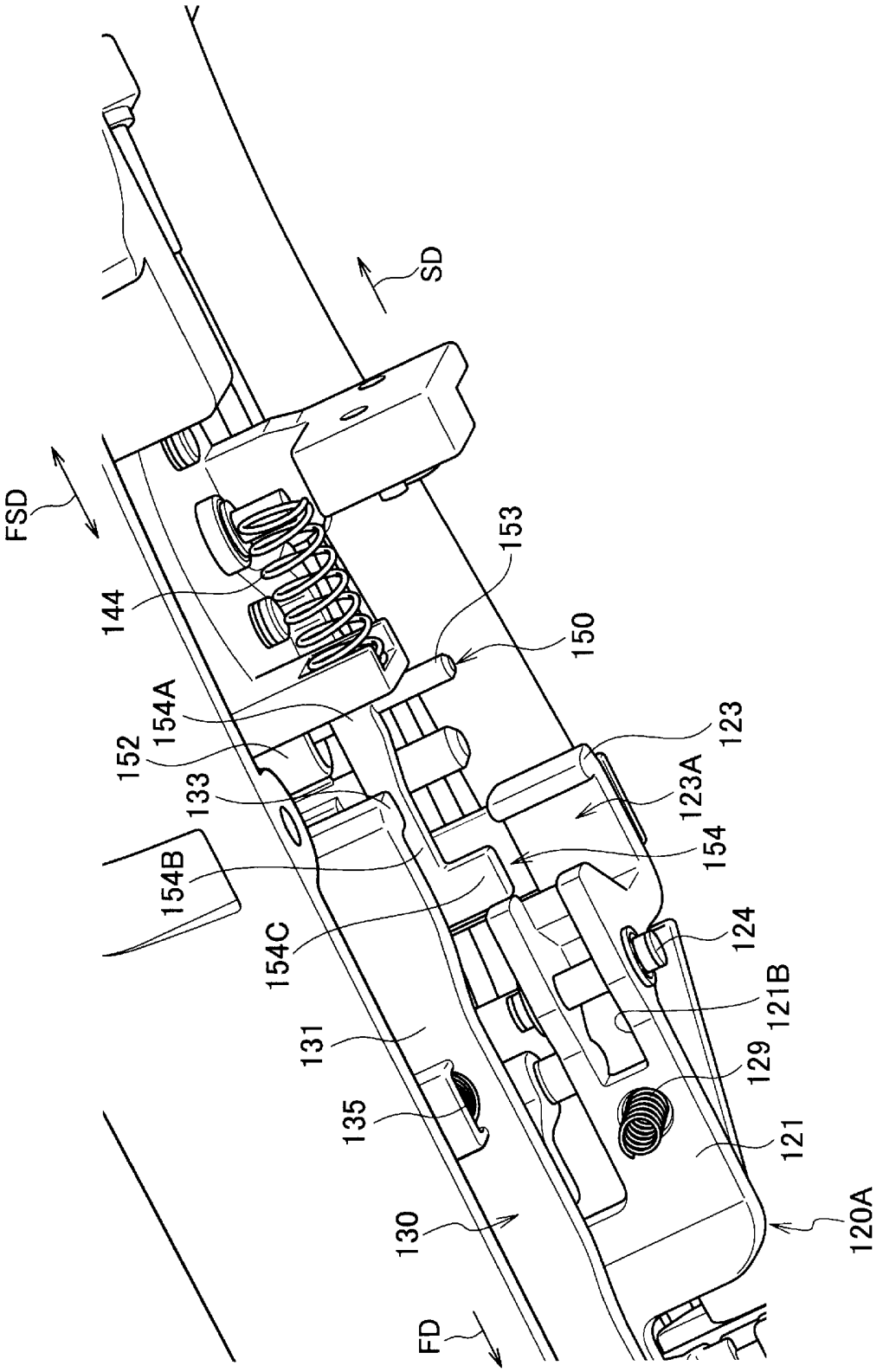
[Fig. 7]


(a)
110
MS
121A
120B
126
FD
120A
121
129
SD
(b)
110
MS
121A
120B
126
FD
120A
121
129
SD

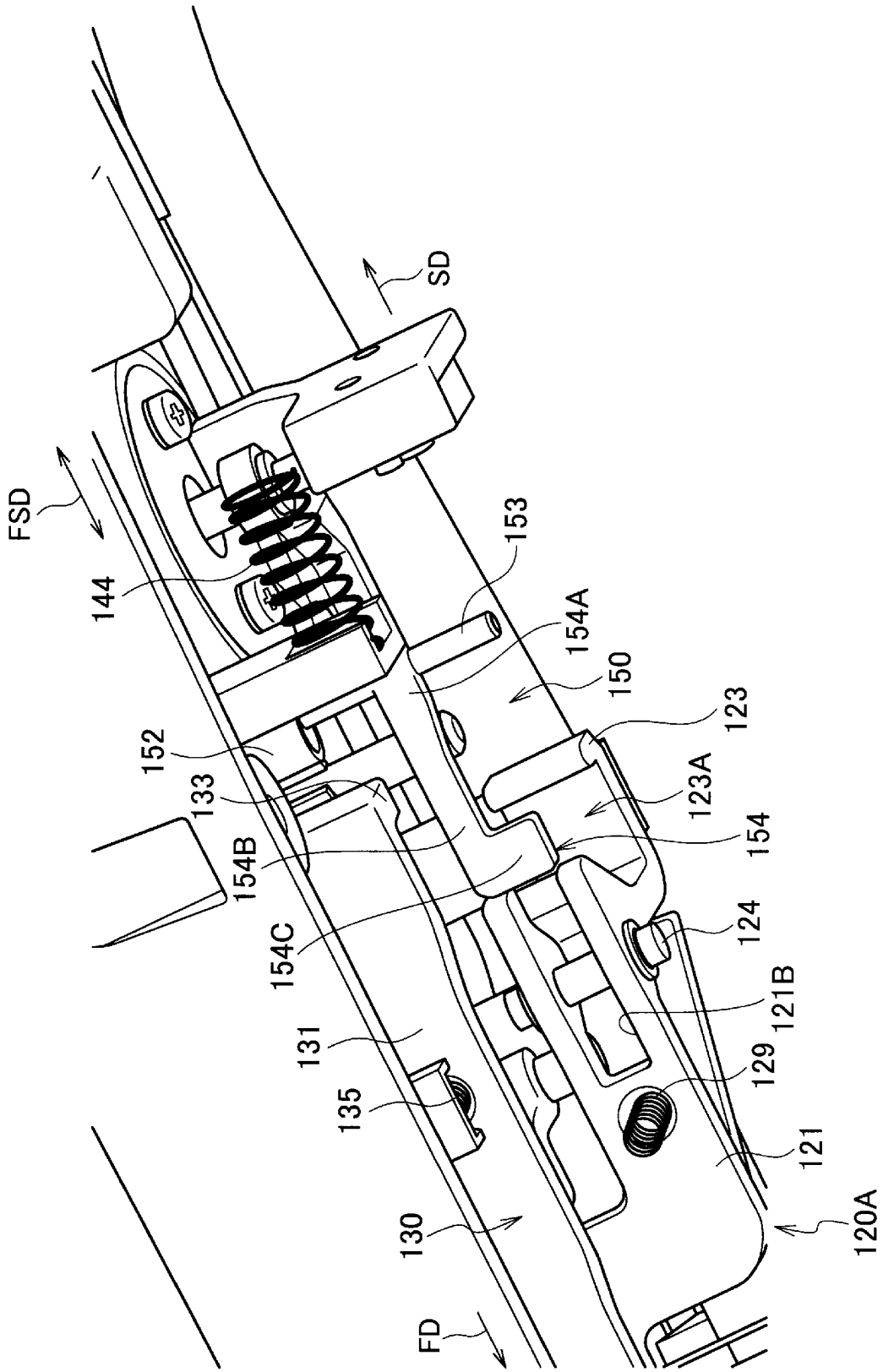
[Fig. 8]


140
141
142
W
SD
143B
143
143A
127A
127
127B
142A
144
123
120B
123A
FSD
133
124
126
120A
121B
129
135
121
130
120B
131
134
FD

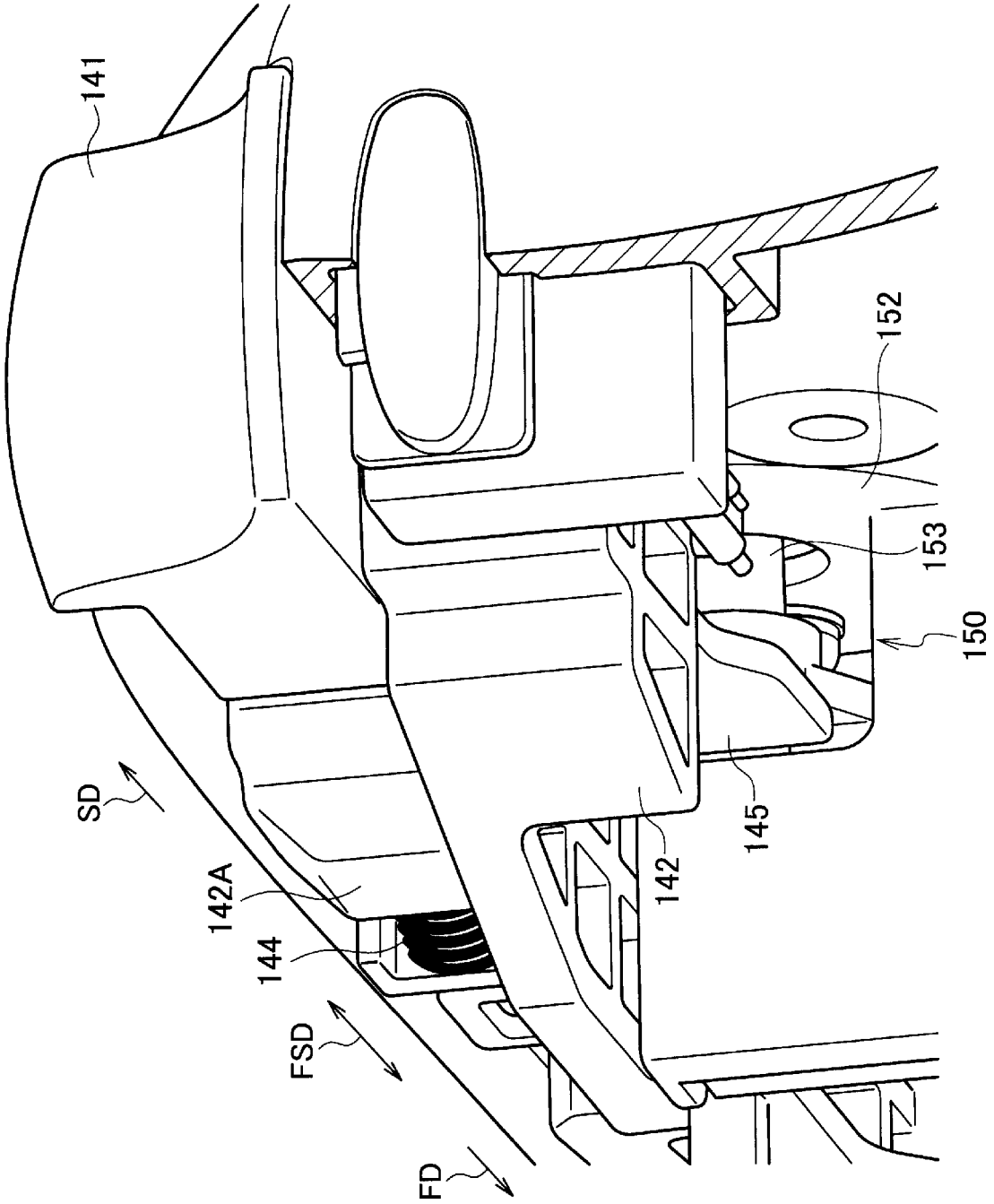
[Fig. 9]


SD
FSD
144
153
150
154A
152
133
123
123A
154
154B
154C
124
121B
131
129
135
121
130
120A
FD

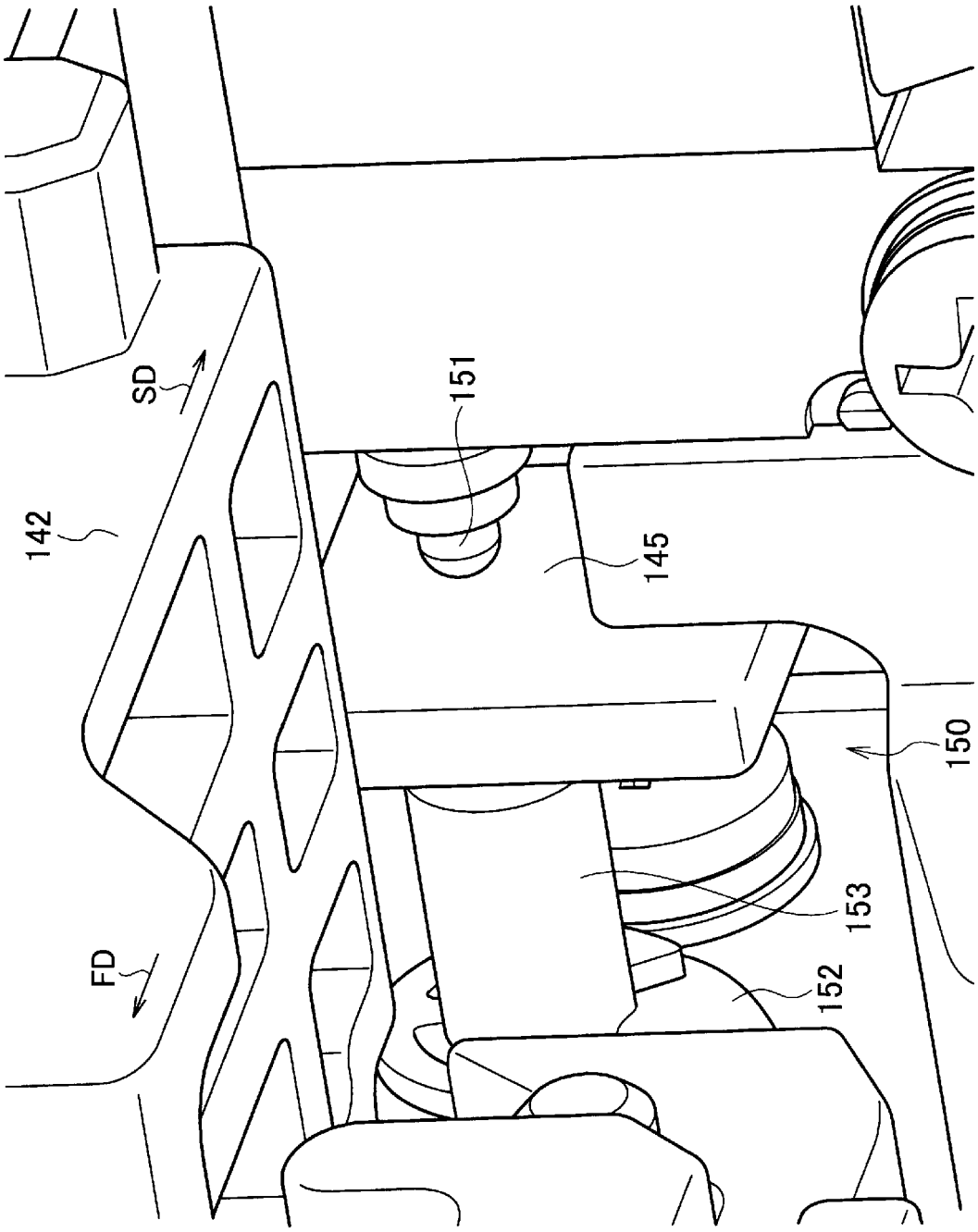
[Fig. 10]


SD
FSD
144
153
154A
150
123
152
133
123A
154
154B
154C
124
121B
131
129
135
121
130
120A
FD

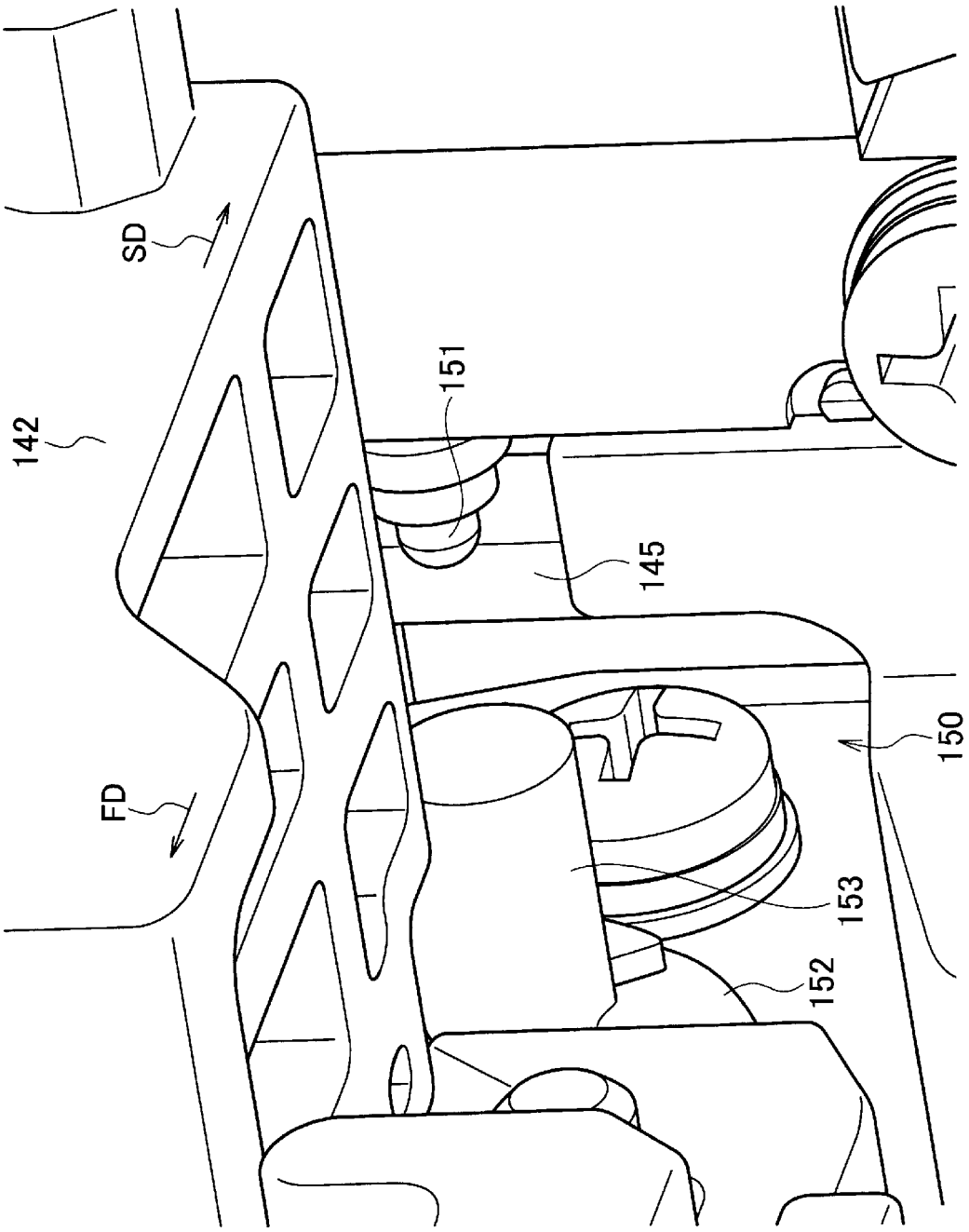
[Fig. 11]



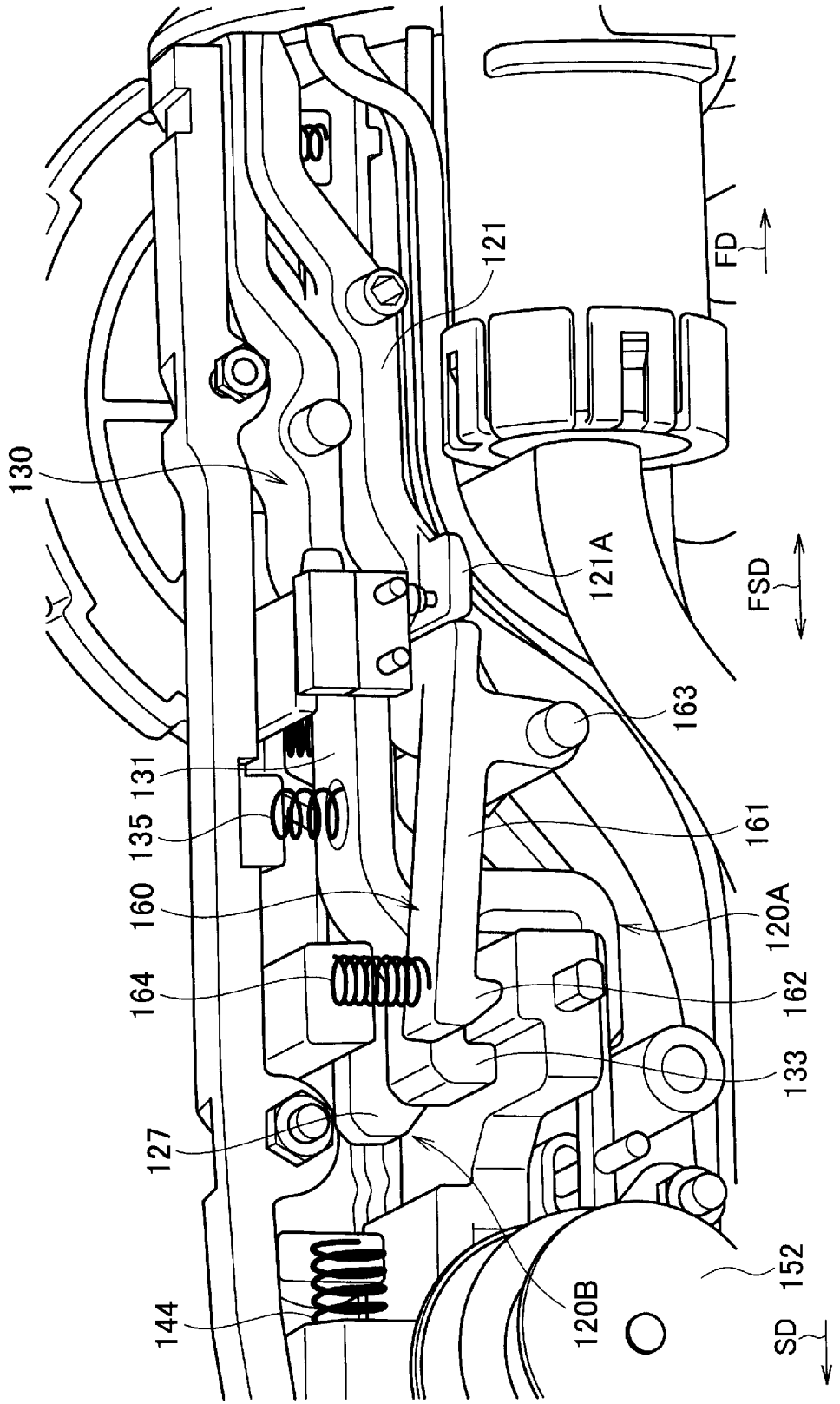
[Fig. 12]



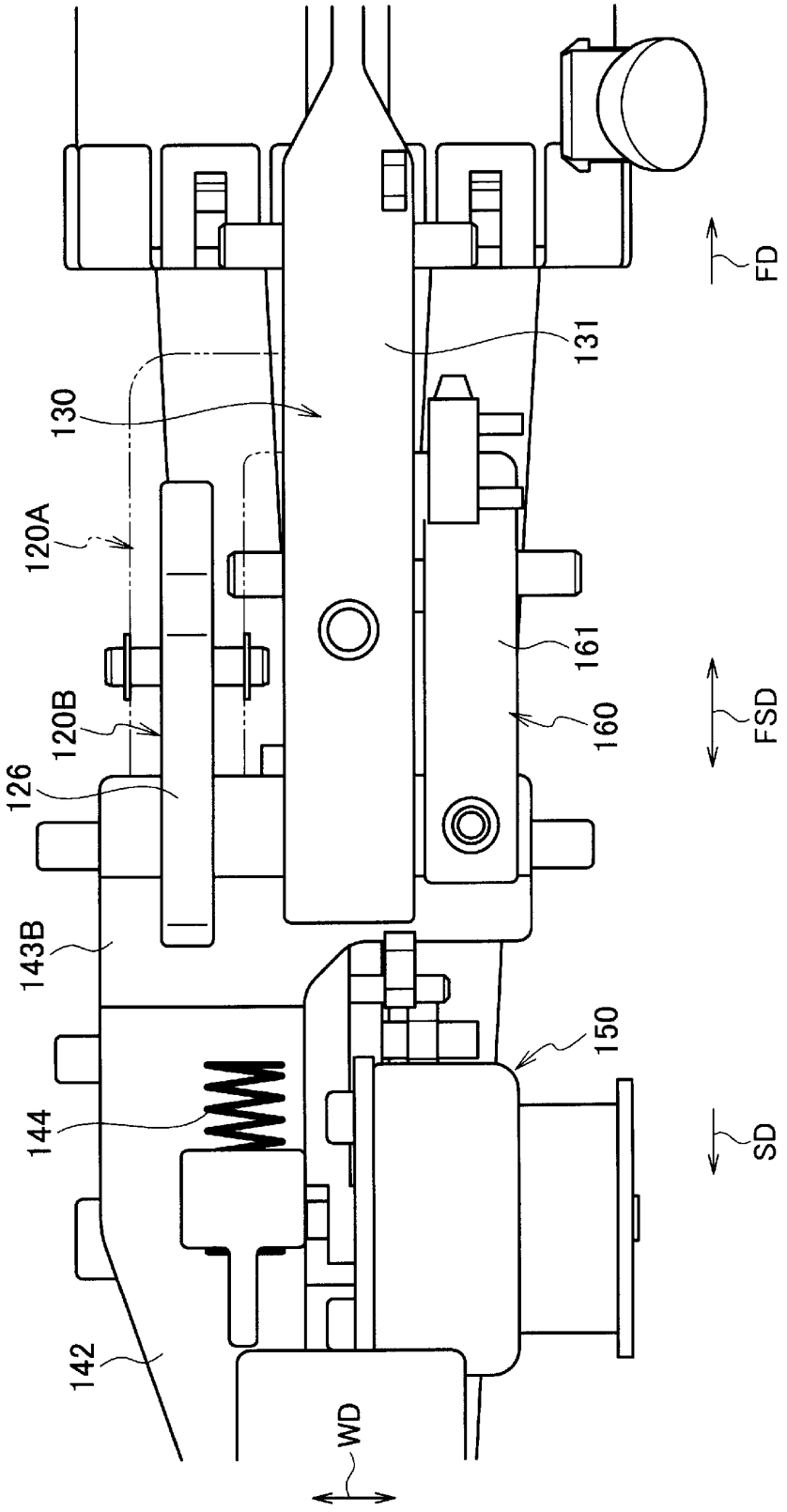
[Fig. 13]



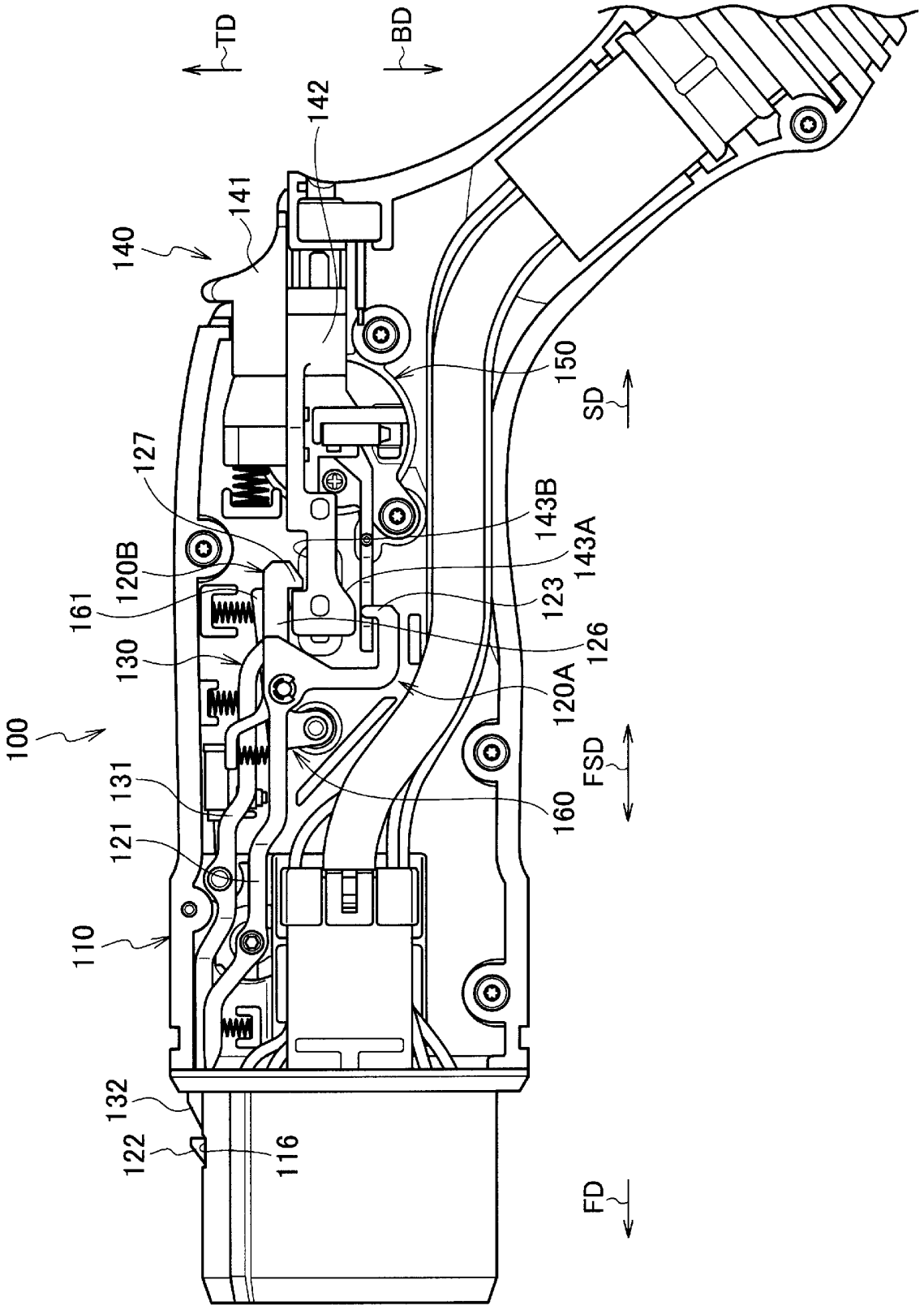
[Fig. 14]


121
FD
130
121A
FSD
163
131
135
161
160
120A
164
162
133
127
152
144
120B
SD

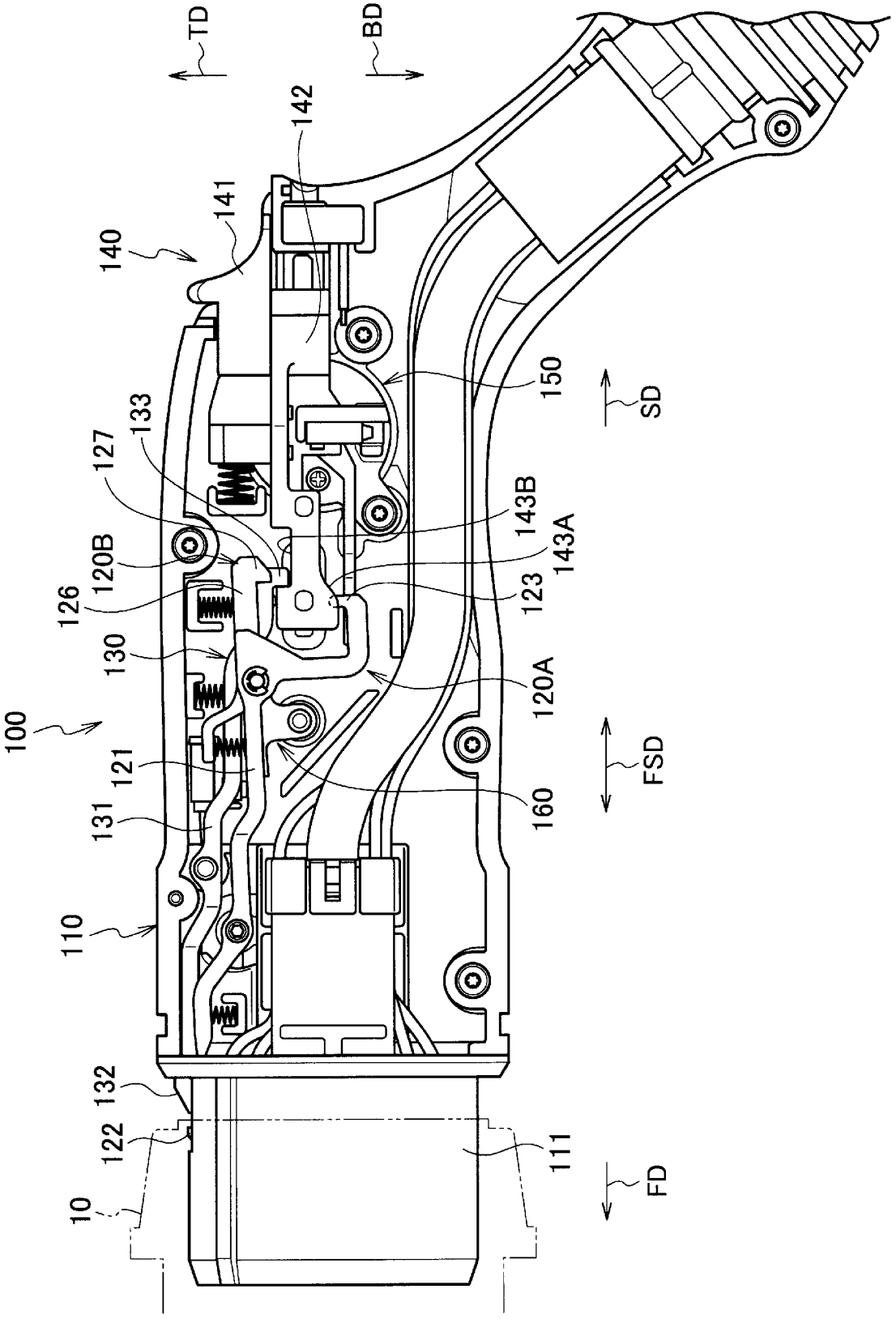
[Fig. 15]



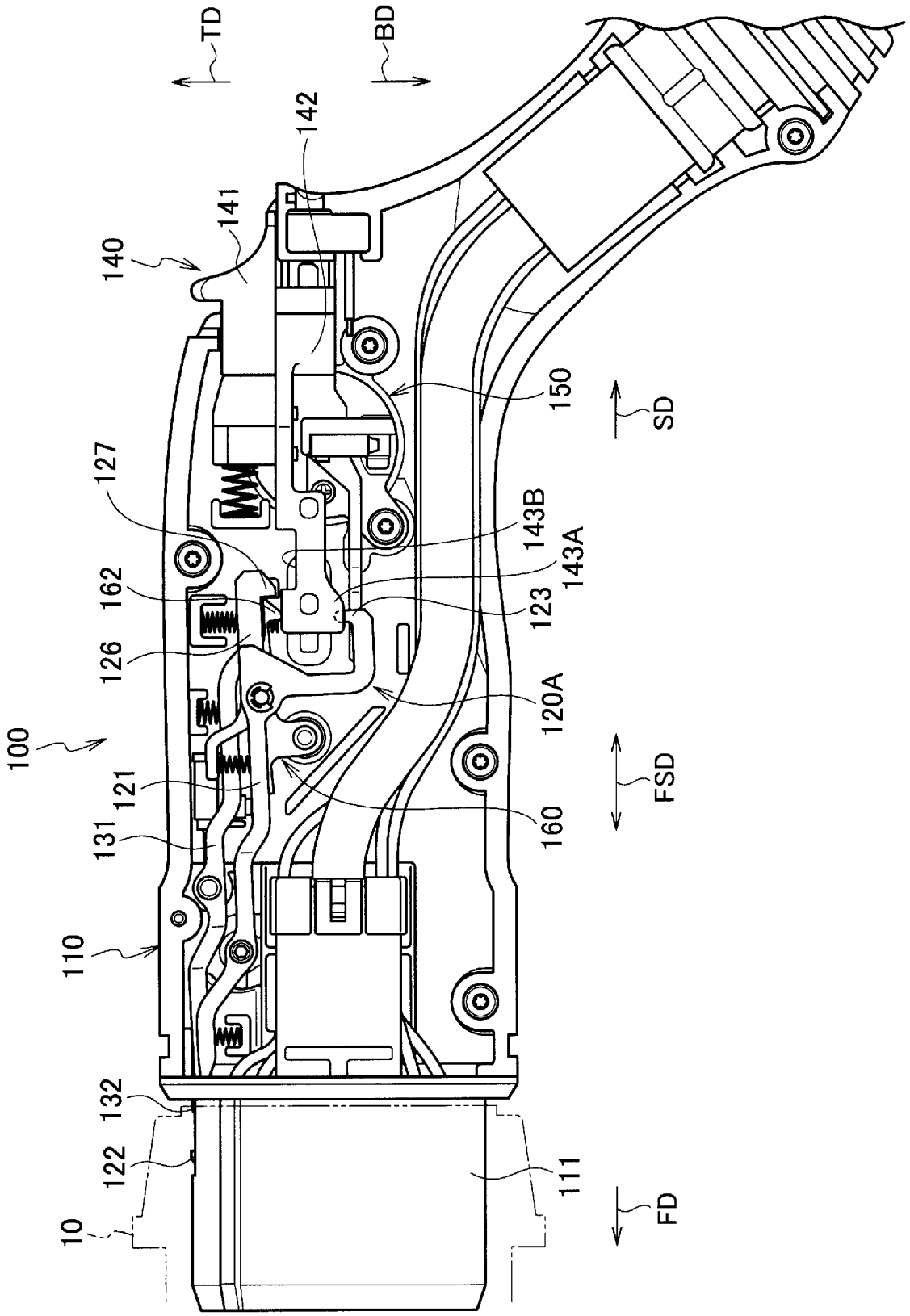
[Fig. 16]


TD
BD
142
141
140
150
SD
127
143B
143A
120B
161
123
126
130
120A
100
FSD
131
160
121
110
132
122
116
FD

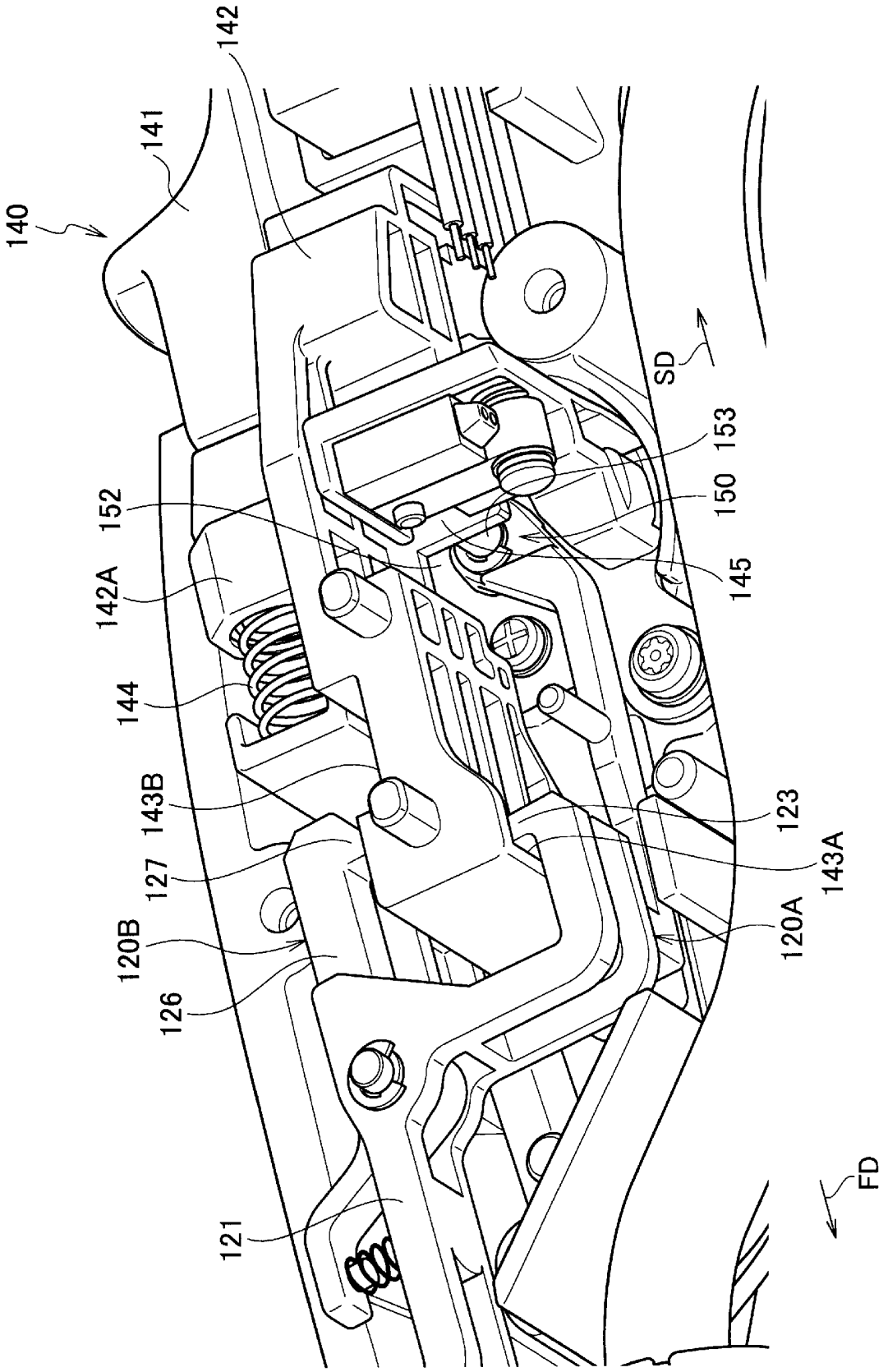
[Fig. 17]


TD
BD
142
141
140
150
SD
133
127
143B
143A
120B
126
123
130
120A
100
121
160
FSD
131
110
132
122
111
10
FD

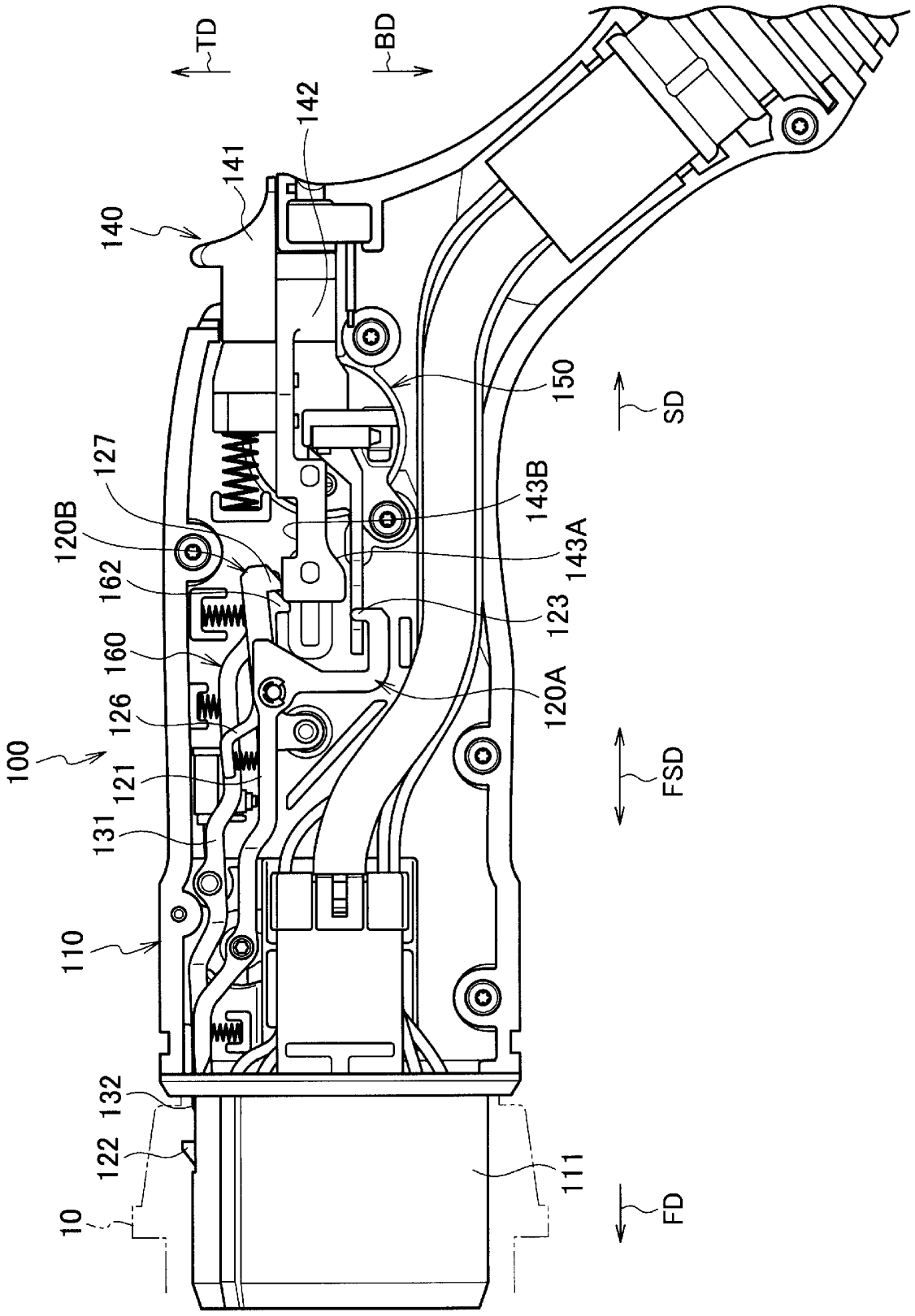
[Fig. 18]


TD
BD
142
141
140
150
SD
127
143B
143A
162
123
126
120A
100
121
160
FSD
131
110
132
122
111
10
FD

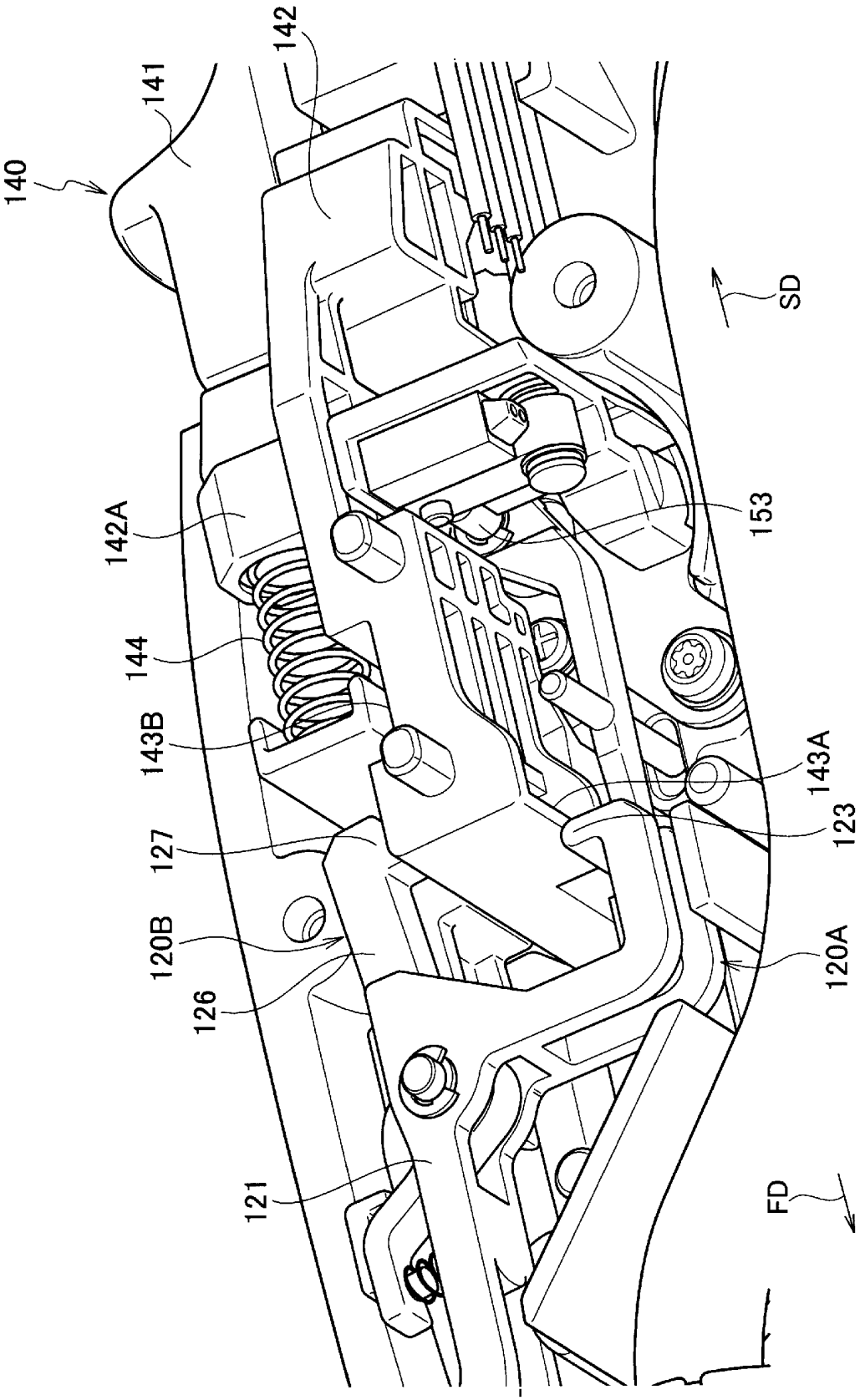
[Fig. 19]


142
141
140
SD
153
150
152
145
142A
144
143B
123
127
143A
120B
120A
126
121
FD

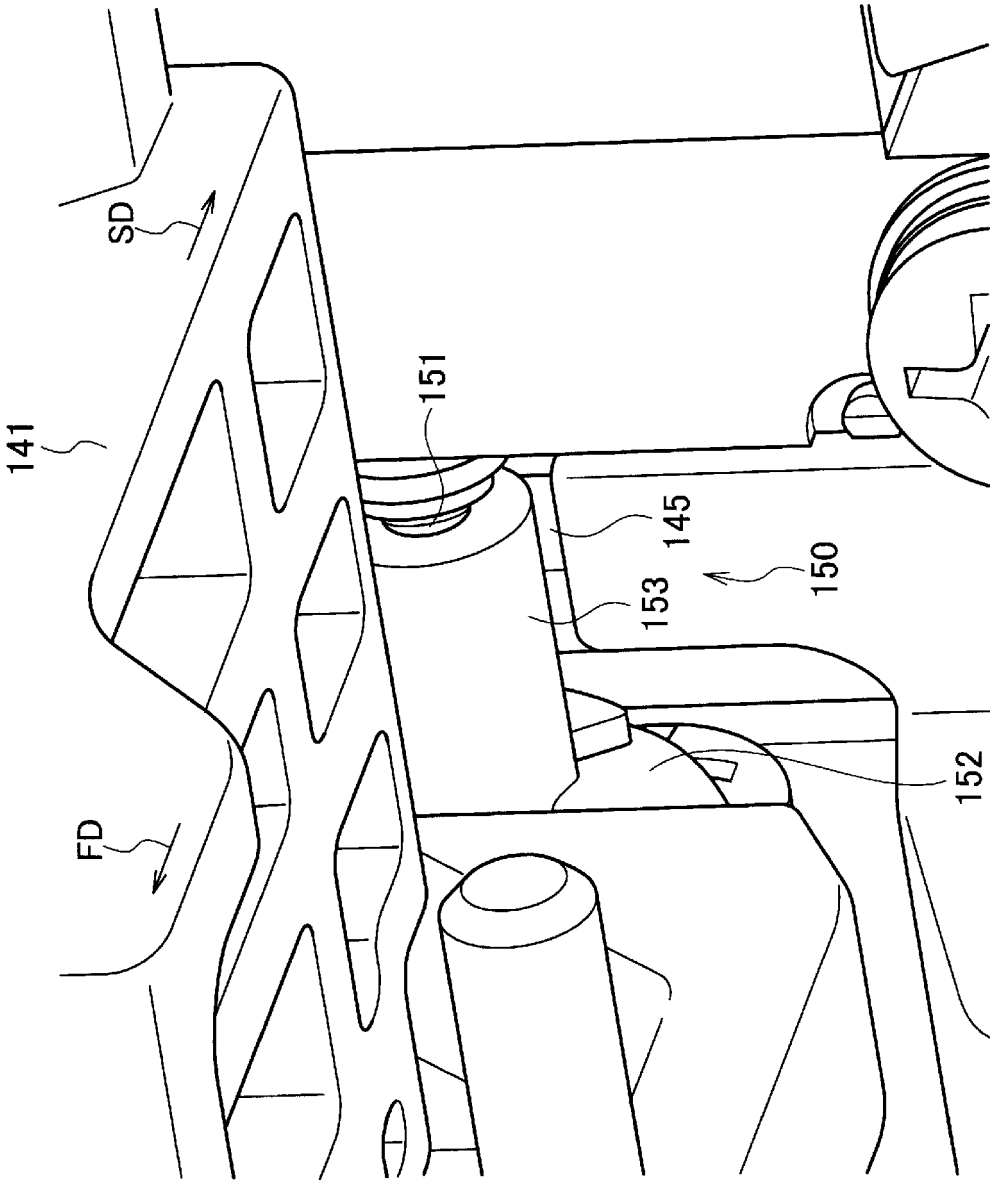
[Fig. 20]


TD
BD
142
141
140
150
SD
127
143B
120B
143A
162
123
160
120A
126
FSD
100
121
131
110
132
122
111
10
FD

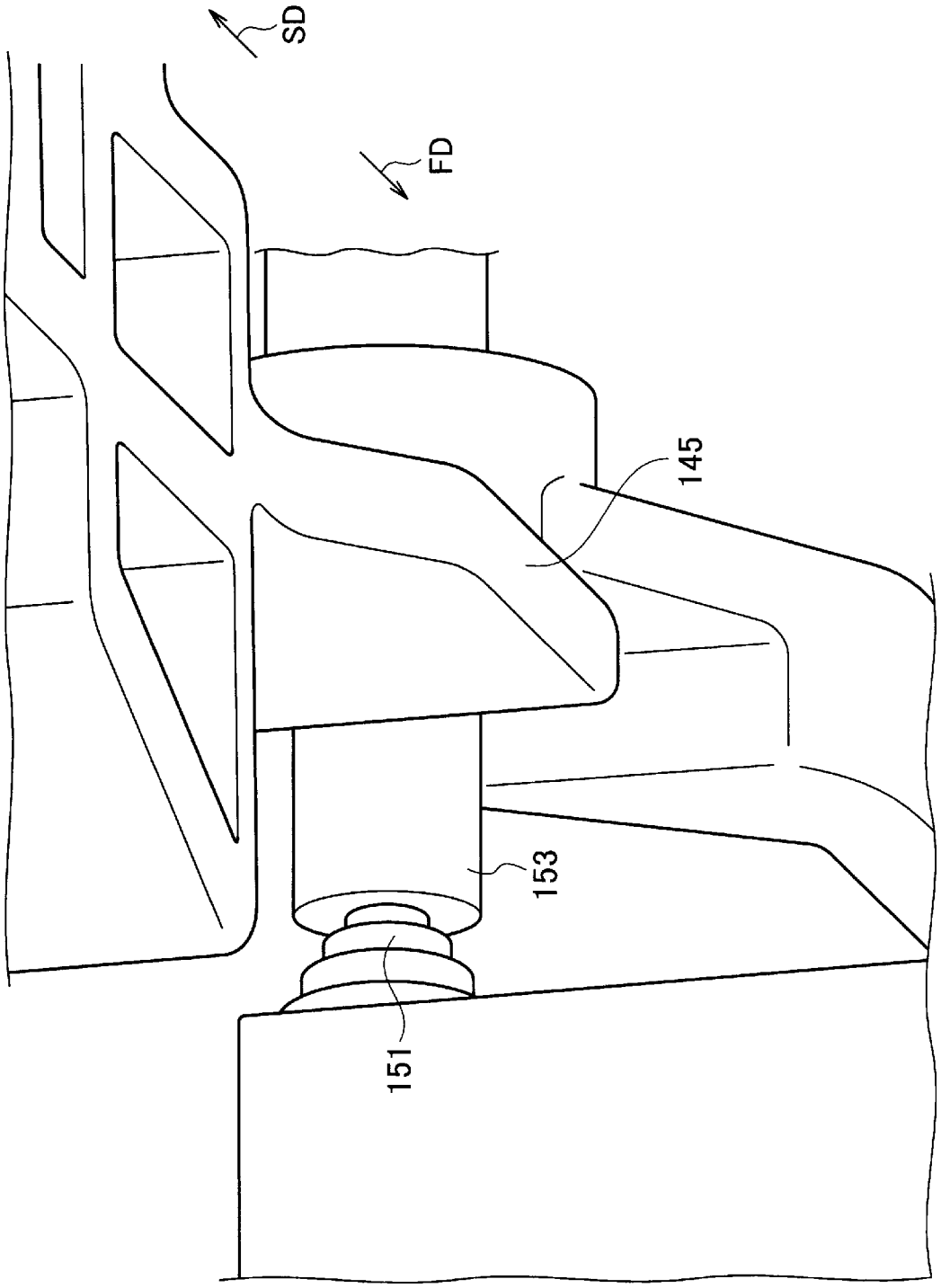
[Fig. 21]


140
141
142
SD
153
142A
144
143B
143A
123
127
120B
120A
126
121
FD

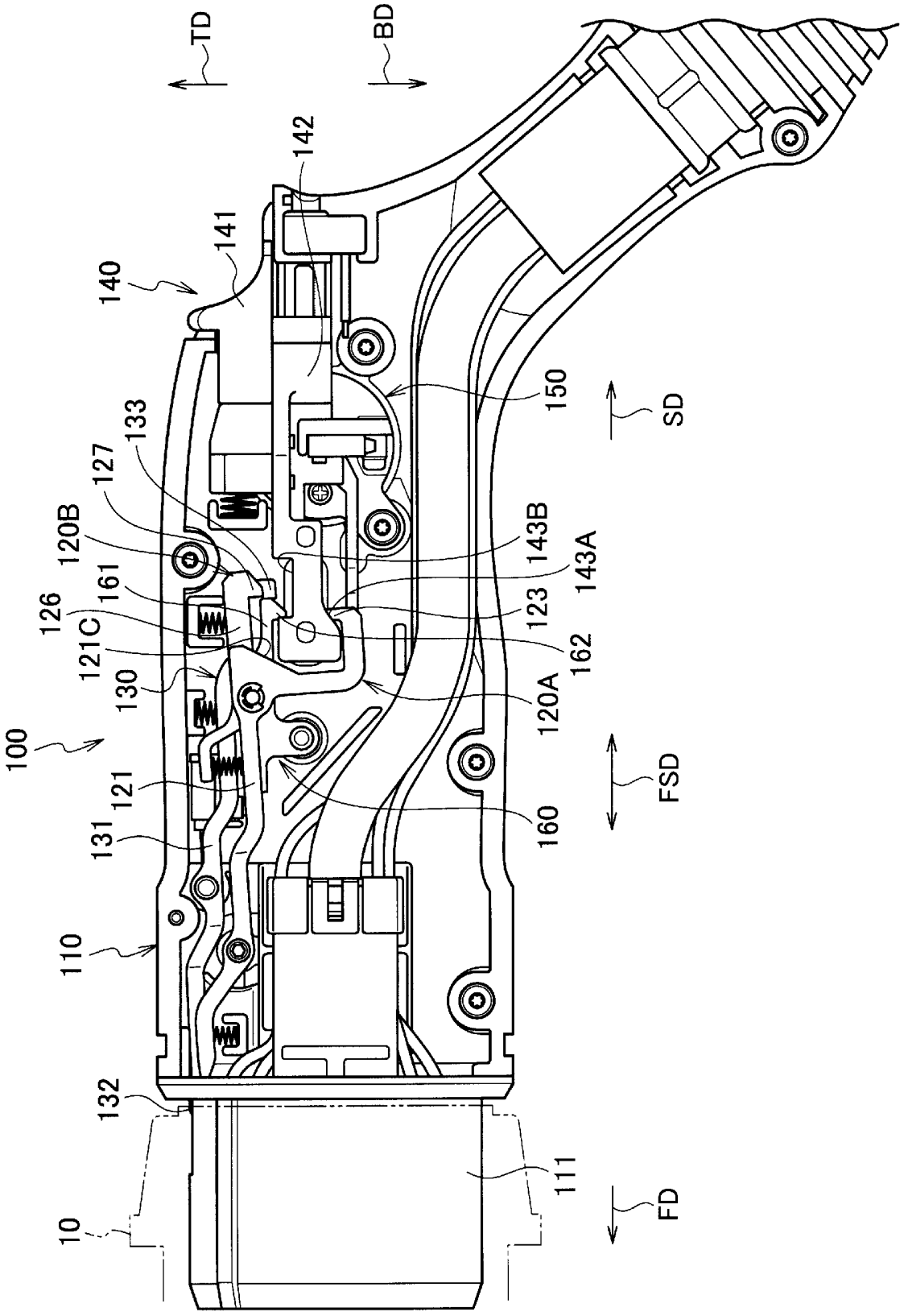
[Fig. 22]



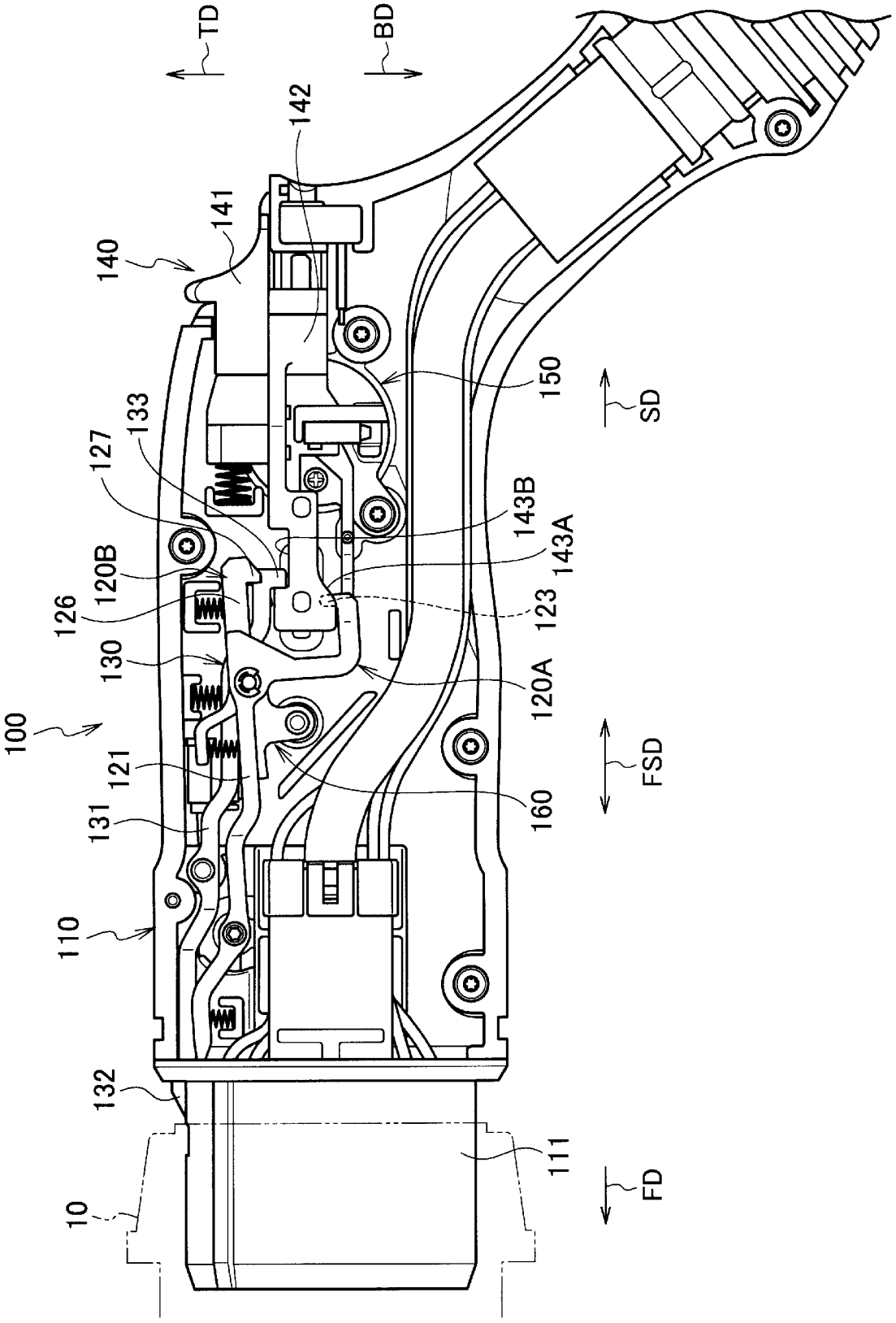
[Fig. 23]



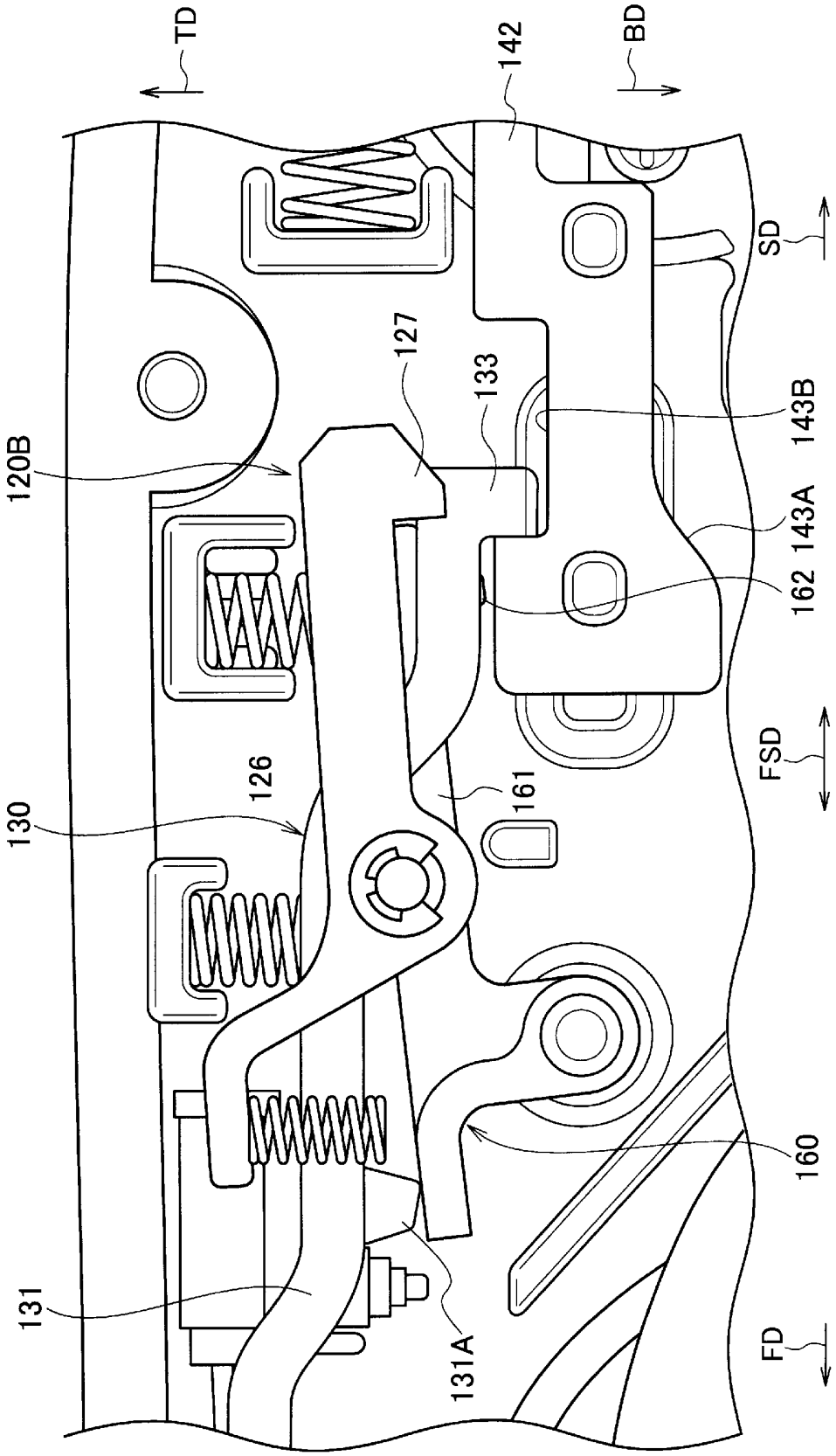
[Fig. 24]


TD
BD
142
141
140
150
SD
133
127
120B
143B
143A
161
126
123
121C
162
130
120A
100
FSD
121
160
131
110
132
111
10
FD

[Fig. 25]


TD
BD
142
141
140
150
SD
133
127
143B
143A
120B
126
123
130
120A
100
121
160
FSD
131
110
132
111
10
FD

[Fig. 26]


TD
142
BD
SD
127
133
143B
120B
143A
162
FSD
126
161
130
160
131
131A
FD

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 5639256 A **[0007]**
- JP 10275653 A **[0008]**